

NEBOSH

International General Certificate

in Occupational Health and Safety

Questions & Answers

The below is a compilation of questions and answers from various sources. This compilation is divided into 3 parts.

- (1) Past Questions & Answers from NEBOSH IGC Examinations with answers from experts.
- (2) Practice Questions & Answers from NEBOSH IGC Examinations with answers presented in bulleted form. The author takes no responsibility for answers given in exams in the style portrayed in the PRACTICE questions and answers written by the author.
- (3) Revision Questions & Answers from NEBOSH IGC Examinations with answers presented element wise. As their name indicates, these questions intended to help you revise the main points of each unit. Having said that, many of the questions could also be found, little changed, in your Certificate examination. Generally, the questions are arranged in ‘syllabus content’ order.

Note: Some of the questions in the below sections are from NEBOSH NGC. The NGC and IGC refer different legislation in their exams so it would not be the best idea to have a look through the NGC1 papers however the NGC2 (the risk paper) does have similar general questions but be careful again of the references to legislation. The author recommends sticking to the IGC exam papers only to prevent any issues and confusion when the exam time arrives - it will be no good having model answers for an NGC question for an IGC question. Also note that wherever allotted marks were mentioned in the original source, they have been also been mentioned over here.

Action Verbs

- ↳ define - provide a generally recognised or accepted definition
- ↳ describe - give a word picture
- ↳ explain - give a clear account of, or reasons for
- ↳ give - provide without explanation (used normally with the instruction to ‘give an example [or examples] of ...’)
- ↳ identify - select and name
- ↳ list - provide a list without explanation
- ↳ outline - give the most important features of (less depth than either ‘explain’ or ‘describe’, but more depth than ‘list’)
- ↳ sketch - provide a simple line drawing using labels to identify specific features
- ↳ state - a less demanding form of ‘define’, or where there is no generally recognised definition

IGC1: Management of International Health and Safety

Past Questions & Answers from NEBOSH IGC Examinations

Q1 Outline the reasons why accidents should be reported and recorded within a workplace (4)

A1 The reasons why accidents should be reported and recorded within a workplace include:- compilation of accident statistics and the identification of trends to meet legal requirements so that an investigation can be carried out to prevent re-occurrence identify weaknesses in the management system for use in civil claims or to satisfy insurance requirements inform the review of risk assessments

Q2 Explain and meaning of BENCH MARKING (benchmarking is comes under proactive monitoring)?

A2 Benchmarking is the process of comparing one's business processes and performance indicators to industry bests and/or best practices from other industries. Dimensions typically measured are quality, time, and cost and in health and safety accident rates, frequency rates etc.

Q3 Outline the possible effects on health from exposure to high levels of noise (8)

A3 Possible effects on health from exposure to high levels of noise include:- both permanent and chronic effects noise induced hearing loss (caused by damage to the hair cells of the inner ear with reduced hearing capacity at particular frequencies) tinnitus and temporary effects such as temporary threshold shift, acute tinnitus, stress and fatigue, acute trauma such as a burst eardrum caused by exposure to sudden loud noise

Q4 Outline the measures that could be taken to minimize the risks to young employees. (4)

A4 A special risk assessment must be made before a young person is employed. This should help to identify the measures which should be taken to minimize the risks to young people.

Measures should include:

- additional supervision to ensure that they are closely looked after, particularly in the early stages of their employment
- induction and other training to help them understand the hazards and risk at their work place
- not allowing them to be exposed to extremes of temperature, noise or vibration
- not allowing them to be exposed to radiation, or compressed air and diving work
- carefully controlling levels of exposure to hazardous materials so that exposure to carcinogens is as near zero as possible and other exposure is below the WEL limits which are set for adults
- not allowing them to use highly dangerous machinery like power presses and circular saws; explosives mechanical lifting equipment such as forklift trucks etc.
- Restricting the weight that young persons lift manually to well below any weights permitted for adults.

There should be clear lines of communication and regular appraisals. A health surveillance programme should also be in place.

Q5 An organisation uses small quantities of toxic chemicals. **Outline** the control measures that might be required in order to minimise risks to workers. (8)

A5 use of suitable containers for the chemicals carrying warning signs as to their danger the methods used for handling the chemicals procedures for the cleaning up and containment of the spillages the provision of adequate ventilation for the working areas and the use of personal protective equipment such as chemical proof gloves, eye protection and overalls site rules setting out the hygiene procedures to be followed and prohibiting eating or smoking in the working areas setting up emergency procedures including first aid provision providing employees with instruction, information and training on the handling of toxic substances and ensuring the provision of adequate supervision and monitoring to check that control measures were being followed.

Q6 Contractors are carrying out a major building project for an organisation. **Outline** how this organisation could reduce the risks to contractors before the start of and during the building project. (8)

A6 An organisation can reduce the risks to contractors by:- initial selection of a competent contractor ensuring they had sufficient resources and had allowed sufficient time to enable the work to be completed safely need to share information with the contractor on the particular risks in the working area for instance the presence of vehicles including fork lift trucks and the danger of falling materials sharing the location of hazardous materials such as asbestos and the location of services such as electricity, water and gas general site safety rules such as a smoking policy and reference to the host employer's safety policy any requirements for permits to work for certain work activities, accident reporting procedures, emergency procedures informing them of the main contact on site informing them of the location of welfare facilities including first aid. whilst the building work was in progress, there would have to be ongoing cooperation and coordination with the contractor with regular monitoring of performance in ensuring the health and safety of both their and the organisation's workers.

Q7 Outline the health and safety issues on which employers should consult their workers (6)

A7 The health and safety issues which employers should consult their workers on includes:- risk assessments personal protective equipment issues training issues introduction of any measure at the workplace that may substantially affect workers health and safety such as change in the materials being used changes in the organisational structure arrangements for appointing and/or nominating competent persons to assist in complying with the health and safety requirements introduction of emergency procedures welfare issues incentive schemes introduction of policies on smoking, alcohol and substances misuse.

Q8 Identify the factors that could contribute to the deterioration in the health and safety culture of an organisation (6)

A8 The factors that could contribute to the deterioration of a company's health and safety culture include:-
the lack of leadership and commitment at senior level
the lack of effective communication with the workers
an inadequate level of supervision
the suspicion of a blame culture
time pressures with production over-riding health and safety
the lack of monitoring or where this did take place, a failure to implement suggested remedial action
the lack of consultation and workers involvement
poor working environments
high staff turnover and a reduction in staffing levels

external influences such as downturn in the economy leading to a lack of investment and resources and a fear for job security

Q9 Outline the factors that the employer should take into account when selecting individuals to assist in carrying out a risk assessment (6)

A9 The factors that should be taken into account when selecting individuals to assist in carrying out a risk assessment include:-
individuals' past experience and training in hazard identification and in carrying out risk assessments
their experience of the process or activity carried out in the workplace and their knowledge of the plant and equipment involved
their ability to understand and interpret regulations, standards and guidance
their communication and reporting skills
an awareness of their own limitations
their attitude and commitment to the task.

Q10 Explain the criteria which must be met for a general risk assessment to be 'suitable and sufficient' (4)

A10 identify all significant hazards and risks arising from or connected with the activity to be carried out
identify all the persons at risk including employees, other workers and members of the public
evaluate the adequacy and effectiveness of existing control measures and identify other protective measures that may be required
enable priorities to be set
be appropriate to the nature of the work
be valid over a reasonable period of time

Q11 Identify FOUR types of emergency that would require an organisation to have an emergency procedure. (4)

A11 Emergency procedures that companies might need to have in place include those for:-
evacuation in case of fire
for accidents
for dangerous occurrences such as chemical spillage
for a security or intruder alert and in the event of an explosive device being discovered on site.
Excavation work is being carried out on a construction site.

Q12 Identify the control measures needed to reduce the risk to workers (8)

A12 The control measures needed to reduce the risk to workers include:-
the detection of underground services by using plans or cable/pipe detectors
supporting the sides of the excavation by shoring or benching
storing materials and spoil away from edge of the excavation
providing means to prevent vehicles falling into the excavation such as stop blocks
providing guard-rails and barriers to prevent people falling into the excavation
providing means of support for adjacent structures to prevent collapse
providing safe means of access/egress into the excavation
testing for noxious fumes and providing ventilation if necessary
using pumps to protect against flooding
taking precautions to safeguard the workers from biological hazards or those caused by the presence of contaminated ground

arranging for the excavation to be inspected at regular intervals by a competent person

Q13 EXPLAIN the difference between consulting and informing workers in health and safety issues. [2]

A13 Consulting is a two way process where the employer would involve, listen to and take on board the views and suggestions of their employees before decisions are taken. On the other hand, informing is a one way process where the employer would simply supply the information to their employees regarding such matters as hazards, risks and control measures.

Q14 OUTLINE the health and safety issues on which employers should consult their workers. [6]

A14 Employers should consult their employees on many matters that may significantly affect their H&S: Changes in organisational structure, change in the materials they use, changing the procedure for nominating or appointing competent persons to assist in complying with H&S arrangements and requirements, any welfare issues, the introduction of policies regarding smoking, alcohol and drug misuse. The introduction of emergency procedures would also require consultation with employees.

Q15 With respect to undertaking general risk assessments on activities within a workplace:

a) **OUTLINE** the key stages of the risk assessment process, IDENTIFYING the issues that

would need to be considered at EACH stage (10)

b) **EXPLAIN** the criteria which must be met for the assessment to be 'suitable and sufficient' (4)

c) **OUTLINE** the factors that the employer should take into account when selecting individuals to assist in carrying out the required risk assessment (6)

A15

a) The first stage is to consider the activities that are being undertaken at the workplace and to identify the significant hazards involved.

Second stage is to identify those exposed to the hazards such as operators, maintenance staff, cleaners and visitors and noting in particular groups who might be especially at risk such as young or workers with disabilities.

Third stage would involve an evaluation of the risks arising from the identified hazard, taking into account the likelihood and severity of the harm that could be caused, the frequency and duration of the exposure of the employees, the measures in existence to control the risks and the need and scope for a further reduction in risk by the introduction of additional controls.

The fourth stage involves recording the significant findings of the assessment in a written and retrievable form.

The final stage is concerned with a review and revision of the assessment at regular intervals or more particularly if there are developments in the processes or activities or changes in legislation which indicate that the original assessment may no longer be valid

b) A risk assessment to be deemed suitable and sufficient, should identify all significant hazards and risks arising from or connected with the activity to be carried out, identify all the persons at risk including employees, other workers and members of the public, evaluate the adequacy and effectiveness of existing control measures and identify other protective measures that may be required, enable priorities to be set, be appropriate to the nature of the work and be valid over a reasonable period of time.

c) Factors that should have been taken into account include:

individual's past experience and training in hazard identification and in carrying out risk assessments

their experience with the process or activity carried out in the workplace and their knowledge of the plant and equipment involved
their ability to understand and interpret regulations, standards and guidance
their communication and reporting skills
an awareness of their own limitations and their attitude and commitment to the task.

Q16 Outline the general content of the THREE sections of a health and safety policy (6)

A16 The three sections of the health and safety policy are:

Statement of intent - which both demonstrates management's commitment to health and safety and sets goals and objectives for the organisation

Organisation section - which allocates health and safety responsibilities within the company

Arrangements section - which sets out in detail the systems and procedures to implement the policy covering issues such as controlling hazards, monitoring compliance and arrangements for consultation and communication with employees

Q17 Explain why the health and safety policy should be signed by the most senior person in an organisation, such as a Managing Director or Chief Executive Officer (2)

A17 The reason the policy is signed by the most senior person in an organisation is to demonstrate managements commitment. It also gives authority to the policy and allows others to be able to identify the person ultimately responsible for health and safety in the organisation.

Q18 Outline, with examples, the general hierarchy that should be applied in order to control health and safety risks in the workplace (8)

A18 Eliminating the risks - by designing them out, changing the process or contracting the work out.

Reducing the risks - substituting a hazardous substance for a less hazardous substance and reducing exposure time by job rotation

Isolation - using enclosures, barriers or worker segregation

Engineering controls - such as guarding, the provision of local exhaust ventilation systems, the use of reduced voltage systems or residual current devices

Provision of personal protective equipment - such as ear defenders or respiratory protective equipment

Q19 OUTLINE reasons for promoting and maintaining good standards of health and safety in the workplace. (8).

A19 The fundamental reasons for promoting and maintaining good standards of H&S are:
Moral, Social and Economic.

Moral...there is a need to provide a reasonable standard of care for all employees to reduce injuries, pain and suffering that may be caused to employees as a result of accidents or ill-health.

Social...there is a need to provide a safe place of work, safe plant/equipment, safe systems of work, a good standard of instruction, training, supervision and competent employees.

Economic...Greater productivity and higher quality due to the high morale enjoyed by the work force, the reduction in costs associated with accidents/investigations, reduction in the cost of employing/training replacement staff and repair /replacement equipment, a more positive image and reputation of the organisation and lower insurance premiums can all add to the economic benefits gained as a result of good H&S standards in the work place.

Q20 Outline the factors that should be considered when selecting individuals to assist in carrying out risk assessments in the workplace. (5)

A20 The most important factor is the competence and experience of the individuals in hazard identification and risk assessment. Some training in these areas should offer evidence of the required competence.

They should be experienced in the process or activity under assessment and have technical knowledge of any plant or equipment used. They should have knowledge of any relevant standards, HSE guidance and regulations relating to the activity or process. They must be keen and committed but also aware of their own limitations. They need good communication skills and be able to write interesting and accurate reports based on evidence and the detail found in health and safety standards, codes of practice, regulations and guidance. Some IT skills would also be advantageous. Finally, the views of their immediate supervisor should be sought before they are selected as team members.

Q21 Describe the key stages of a general risk assessment. (5)

A21 There are five key stages to a risk assessment suggested by the HSE as follows:

Stage 1 is hazard identification which involves looking at significant hazards which could result in serious harm to people. Trivial hazards should be ignored. This will involve touring the workplace concerned looking for the hazards in consultation with workers themselves and also reviewing any accidents, ill health or incidents that have occurred.

Stage 2 is to identify the person who could be harmed – this may be employees, visitors, contractors, neighbours or even the general public. Special groups at risk, like young persons, nursing or expectant mothers and people with a disability, should also be identified.

Stage 3 is the evaluation of the risks and deciding if existing precautions or control measures are adequate. The purpose is to reduce all residual risks after controls have been put in to as low as is reasonably practicable. It is usual to have a qualitative approach and rank risks as high, medium or low after looking at the severity of likely harm and the likelihood of it happening. A simple risk matrix can be used to get a level of risk. The team should then consider whether the

existing controls are adequate and meet any guidance or legal standards using the hierarchy of

controls and the General Principles of Prevention set out in the Management Regulations.

Stage 4 of the risk assessment is to record the significant findings which must be done if there are five or more people employed. The findings should include any action that is necessary to reduce risks and improve existing controls – preferably set against a time scale. The information contained in the risk assessment must be disseminated to employees and discussed at the next health and safety committee meeting.

Stage 5 is a time scale set to review and possibly revise the assessment which must also be done if there are significant changes in the workplace or the equipment and materials being used.

Q22 Outline a hierarchy of measures for controlling exposures to hazardous substances. (10)

A22 The various stages of the usual hierarchy of risk controls are underlined in this answer. Elimination or substitution is the best and most effective way of avoiding a severe hazard and its

associated risks. Elimination occurs when a process or activity is totally abandoned because the

associated risk is too high. Substitution describes the use of a less hazardous form of the substance. There are many examples of substitution, such as the use of water-based rather than oil-based paints and the use of asbestos substitutes. In some cases it is possible to change

the method of working so that exposures are reduced, such as, the use of rods to clear drains instead of strong chemicals. It may be possible to use the substance in a safer form; for example, in liquid or pellets to prevent dust from powders. Sometimes the pattern of work can be changed so that people can do things in a more natural way; for example, by encouraging people in offices to take breaks from computer screens by getting up to photocopy or fetch documents.

Reduced or limited time exposure involves reducing the time that the employee is exposed to the hazardous substance either by giving the employee other work or rest periods.

If the above measures cannot be applied, then the next stage in the hierarchy is the introduction

of engineering controls, such as isolation (using an enclosure, a barrier or guard), insulation (used on any electrical or temperature hazard) or ventilation (exhausting any hazardous fumes or gases either naturally or by the use of extractor fans and hoods). If ventilation is to be used, it must reduce the exposure level for employees to below the workplace exposure limit.

Housekeeping is a very cheap and effective means of controlling risks. It involves keeping the

workplace clean and tidy at all times and maintaining good storage systems for hazardous substances.

A safe system of work is a requirement of the HSW Act and describes the safe method of performing the job.

Training and information are important but should not be used in isolation. Information includes such items as signs, posters, systems of work and general health and safety arrangements.

Personal protective equipment (PPE) should only be used as a last resort. There are many reasons for this. It relies on people wearing the equipment at all times and must be used properly.

Welfare facilities, which include general workplace ventilation, lighting and heating and the provision of drinking water, sanitation and washing facilities, are the next stage in the hierarchy.

All risk control measures, including training, and supervision must be monitored by competent people to check on their continuing effectiveness. Periodically the risk control measures should be reviewed.

Monitoring and other reports are crucial for the review to be useful. Reviews often take place at

safety committee and/or at management meetings.

A serious accident or incident should lead to an immediate review of the risk control measures in place.

Finally, special control requirements are needed for carcinogens.

Q23 Outline ways in which employers may motivate their employees to comply with health and safety procedures (8)

A23 Motivation is the driving force behind the way a person acts or the way in which people are stimulated to act.

The best way to motivate employees to comply with health and safety procedures is to improve their understanding of the consequences of not working safely, their knowledge of good safety practices and the promotion of their ownership of health and safety. This can be done by effective training (induction, refresher and continuous) and the provision of information showing the commitment of the organization to safety and by the encouragement of a positive health and safety culture with good communications systems. Managers should set a good example by encouraging safe behaviour and obeying all the health and safety rules

themselves even when there is a difficult conflict between production schedules and health and safety standards. A good working environment and welfare facilities will also encourage motivation. Involvement in the decision making process in a meaningful way, such as regular team briefings, the development of risk assessments and safe systems of work, health and safety meetings and effective joint consultation arrangements, will also improve motivation as will the use of incentive schemes. However, there are other important influences on motivation such as recognition and promotion opportunities, job security and job satisfaction. Self-interest, in all its forms, is a significant motivator. Although somewhat negative, it is necessary sometimes to resort to disciplinary procedures to get people to behave in a safe way. This is rather like speed cameras on roads with the potential for fines and points on your licence.

Q24 Explain why young persons may be at a greater risk from accidents at work. (4)

A24 Young workers have a lack of experience, knowledge and awareness of risks in the workplace.

They tend to be subject to peer pressure and behave in a boisterous manner. They are often willing to work hard and want to please their supervisor and can become over-enthusiastic. This can lead to the taking of risks without the realization of the consequences. Some younger workers have underdeveloped communication skills and a limited attention span. Their physical strength and capabilities may not be fully developed and so they may be more vulnerable to injury when manually handling equipment and materials. They are also more susceptible to physical agents, biological and chemical agents such as temperature extremes, noise, vibration, radiation and hazardous substances.

Practice Questions & Answers from NEBOSH IGC Examinations

Q1 A leisure centre manager intends to introduce new work processes that require risk assessment. **Outline** which factors to consider while carrying out the risk assessment. (8)

A1 Factors to identify:

Activities being undertaken

Hazards involved

Likelihood and severity of the harm that may be caused

Number of employees exposed and exposure frequency

Competence of persons carrying out activities

Evaluation of existing control measures

Competence of person doing the assessment

Q2 Explain what is required for the assessment to be ‘suitable and sufficient’. (4)

A2

It should identify the significant risks arising out of the work activity

It should identify and prioritise the measures that need to be taken to comply with relevant statutory provisions

It should be appropriate to the nature of the work

It should remain valid for a reasonable period of time

Q3 Identify the various circumstances that may require the risk assessment to be reviewed at a later date. (8)

A3

Changes to work processes or methods

Introduction of new plant
Changes to production scale
New information on hazardous substances or processes
Accidents or ill-health becoming apparent
Results of monitoring, inspections, audits and health surveillance
Changes in legislation
Changes affecting personnel i.e. disabilities, young persons and pregnancy
At routine intervals i.e. 6 monthly or yearly review

Q4. Outline possible consequences of not achieving good standards of health and safety. (8)

A4 Recognition of the financial and legal implications of poor health and safety performance should be outlined with details of:

Costs of accidents and ill-health in terms of lost production
Loss of key personnel
Replacement staff costs
Investigation costs
Higher insurance premiums
Equipment/plant damage and replacement costs
Legal defence costs
Fines
Possible imprisonment
Product quality
Resource allocation
Public and employee relations

Q5 A machine operator is involved in an accident by coming into contact with a dangerous part of a machine, **describe:**

Q5 A. The possible immediate causes (4)

A5 A.
Inadequate or non-existent safety devices
Poor housekeeping
Loose clothing
Machine malfunction
Operator error

Q5 B. The possible root (underlying) causes (4)

A5 B
Inadequate training
Inadequate instruction/supervision
Poor maintenance
Inadequate risk assessment
Personal factors – stress, fatigue and the influence of drugs and alcohol
Poor management systems
Selection of personnel
Selection of correct equipment

Q6 Identify EIGHT informative sources that may be consulted while developing a safe system of work (8)

A6 Be specific

Statutory instruments
Approved Codes of Practice – ACOP's

HSE guidance
Manufacturers' information
European and other official standards
Industry and trade literature
Results of risk assessments
Accident statistics
Health surveillance records
The employees involved
Enforcement agencies and other experts

Q7 Outline reasons why verbal communication may not be clearly understood by an employee. (8)

A7. This is an outline question which should give reasoned answers by way of examples and not just a simple list. Reasons should include:

Noise and distractions
Use of technical jargon
Complexity of information
Communication is ambiguous
Language/dialect barriers
Sensory impairment
Mental difficulty
Lack of attention
Inexperience
Lengthy communication chains

Q8 Identify the factors that could place a greater risk of accidents at work on young persons. (4)

A8
Lack of knowledge
Lack of experience
Lack of training
Physical development of the individual
Nature of young persons to take risks
Peer group pressures in young persons is generally greater than that of more experienced individuals

Q9 Outline possible measures to minimise the risks to young persons at work. (4)

A9 Risk assessment specific to young persons
Induction training
Careful supervision by experienced and responsible workers
Specific health surveillance
Clear lines of communication
Restriction on type of work and hours worked

Q10 Define 'ergonomics' (2)

A10. There are many acceptable definitions:
The study of the interaction between workers and the work environment
Making the job or task fit the person
The study of how people interact with machinery or equipment within the workplace

Ergonomics is the application of scientific information concerning humans to the design of objects, systems and environment for human use

Fitting the job to the people who have to do it, through the design of equipment and procedures

Fitting the person to the job, through the use of placement procedures or training

The study of how the workplace relates to human functions

Q11. List SIX observations of a machine operators station which could suggest that the machine has **not** been ergonomically designed. (6)

A11.

The need for excessive force or repetitive movements

The need to stretch or stoop

Machine controls in awkward positions

Controls unmarked or poorly marked and functions not obvious

Lack of visibility by the operator

Size or weight of work item making it difficult to position or because of type of machine protection

Difficulty in changing, adjusting or cleaning machine tools

Q12 Explain the meaning of ‘so far as is reasonably practicable’ (2)

A12 Balance of risk against cost

Q13 List what may be considered on assessment of a contractor’s health and safety competence. (8)

A13

Previous experience

Reputation

Quality and content of health and safety policy and risk assessments

Level of training and qualifications of staff including health and safety staff

Accident/enforcement statistics

Membership of official bodies

Equipment maintenance records

Detailed proposals of work to be undertaken

Recommendations

Ability to provide safe systems of work for the job i.e. resources

Overall health and safety culture

Their arrangements to fulfil their duties with respect of the health and safety plan

Q14 Define the term ‘negligence’ (2)

A14 Breach of common law legal duty of care to exercise reasonable care towards others, resulting in loss, damage or injury

Or, a tort involving unreasonably careless conduct

Q15. Outline the **THREE** conditions for an employee to prove a case of negligence against an employer. (6)

A15.

1. Defendant under duty of care to claimant (injured party)

2. Duty breached

3. Result of breach - claimant suffered damage or loss

Q16 Describe the effects inadequate lighting in a workplace would have on health and safety. (6)

A16

Eye strain

Headaches

Adopting poor posture

Tripping over unseen objects

Human error is likely to increase.

NOTE: Both individual health risks and physical risks are required.

Q17 Outline which factors should be considered on assessment of the adequacy of lighting within an open plan office. (10)

A17

The tasks being carried out

The equipment used

The size and layout of the office i.e. distance of workstations to windows and the use of partitions

Natural light available at different times of the day and year

Suitability of the number, type, intensity and hue of artificial lights

Computer screen glare

Shadowed areas

Localised lighting, need for and availability of

Maintenance of non-functional, flickering, damaged or dirty lights

Provision and adequacy of emergency lighting.

Q18 State the conditions that must be fulfilled to show that an employer may be held vicariously liable for the negligence of an employee. (4)

A18

The employee was acting in the course of his/her employment

The employee caused damage or injury by not fulfilling a common law duty of care.

Note: BOTH these conditions must be met to find the employer liable.

Q19 Outline management techniques which can encourage a positive attitude to health and safety in the workplace. (8)

A19

Communication

Employee involvement

Incentives

Leading by example

Performance appraisals.

Q20 Outline what type of information is required in a health and safety plan before work commences on a building project. (8)

A20

The nature and risks of the work involved

Method statements

Emergency arrangements

Co-ordination of, and liaison between, the relevant parties

Use of plant and equipment

Site rules
Welfare arrangements
Accident reporting
Instruction and training
Provision and use of personal protective equipment
Monitoring and review arrangements

Q21 Give FOUR reasons why there should be a system for the internal reporting of accidents in an organisation. (4)

A21

The compilation of accident statistics and identifying trends
Investigations may be carried out to prevent future occurrences
Use in civil claims or to satisfy insurance requirements
Help in the identification and reduction of loss
Inform the review of risk assessments.

Q22 Outline the factors that could prevent accidents from being reported at work by employees. (4)

A22

Ignorance of reporting procedures
Peer pressure
Possible retribution by management
Preservation of the company's or departments safety record (particularly where incentive schemes are in place)
Avoidance of first-aid or medical treatment
Over-complicated reporting procedures
Lack of management response to earlier reported accidents.

Q23 Outline the information that should be given to employees when they could be exposed to a substance hazardous to health in the workplace. (8)

A23

Nature of substance and its possible effects
How it is to be used, transported and stored
Provision and use of control measures
Possible use of personal protective equipment including information on its availability, storage, cleaning, maintenance and replacement
Procedures relating to personal hygiene
Monitoring
Health surveillance
Emergencies including first-aid and spillage procedures.

Q24 Outline why a verbal instruction given to an employee may not be clearly understood. (8)

A24

Noise and distractions
Use of technical jargon
Complexity of information
Ambiguity
Language and/or dialect of the speaker
Sensory impairment

Mental difficulty
Inattention or inexperience of the recipient
Lengthy communication chains.

Q25 List FOUR other categories of people rather than employees that an employer owes a duty to take reasonable care. (2)

A25
Visitors
Members of the public
Uninvited persons/trespassers
Contractors

Q26 Outline procedures that could be used to ensure the safety of visitors to an organisations premise. (6)

A26.
Identification of visitors: signing in, badges etc.
Information regarding the risks present and site rules and procedures, especially in emergency situations
Visitor supervision i.e. escorts
Restricted access to certain areas.

Q27 State the requirements of the emergency exits and routes. (8)

A27
Risk assessment to take into account the dimensions of the escape route, length and width, and number of persons to be evacuated.
Doors must open easily and in the direction of escape
Emergency signs and lighting
Escape routes must be kept clear of obstruction at all times
Escape routes must lead directly to a place of safety.

Q28 List the powers given to inspectors. (8)

A28
The right to enter premises, if necessary with police assistance
To carry out examinations and investigations
To direct that premises or equipment be left undisturbed for the purpose of investigations
To take measurements and photographs
To inspect and/or take copies of documents and records
To take samples
To interview a person and obtain a signed declaration of truth
To take possession of articles and substances
To issue enforcement notices
To instigate and conduct proceedings in a magistrates court (except Scotland).
To dismantle and/or test any item or substance which they decide is harmful to health.

Q29 Identify the significant areas that should be considered during a planned health and safety inspection of a workplace. (8)

A29
Substances or materials used
Traffic routes
Means of access and egress

Work equipment
Work practices such as manual handling
Work environment
Electricity
Fire precautions
First-aid facilities
Welfare facilities
Workstation ergonomics
Housekeeping
Actions points from previous inspections

Q30 Outline FOUR requirements of welfare facilities that an employer must provide for his employees. (8)

A30

Sanitary conveniences
Washing facilities
Fresh drinking water
Accommodation for clothing
Facilities for changing
Facilities for resting and eating

Q31 Describe the possible enforcement action that may be brought against an employer failing to provide adequate welfare facilities in the workplace. (4)

A31

Serving of improvement notices or prohibition notices
Possible prosecution
Describe the circumstances that would lead to the issue of a notice
Prosecution would take place in a Magistrates Court
Prohibition notice unusual regarding welfare facilities as serious personal injury would be rare.

Q32 Outline factors that should be considered when devising safe systems of work. (8)

A32

Type of activity of task
The hazards and risks involved
The controls necessary
The equipment and materials used
The working environment
Individuals involved i.e. numbers, level of training
Legal requirements and monitoring systems

Q33 Outline the main topics of health and safety that should be included in an induction training programme. (8)

A33

Emergency procedures
Fire
First aid
Health and safety policy
Management and employee responsibilities for health and safety
Local procedures and work systems

Communication paths

Q34 Outline what factors should be considered in the selection process of personal eye protection for use in the workplace. (8)

A34

Type of hazard i.e. particles, molten metal, chemicals, etc.

The standard of equipment required as specified in British and European Standards

The suitability of different types of equipment i.e. goggles, visors and spectacles

Fit and comfort

Storage and maintenance requirements

Costs

Training needs

Compatibility with other types of PPE

General environment where the equipment will be used.

Q35 Describe what factors should be considered before a demolition project commences. (8)

A35

Location and disconnection of public utilities such as gas, water electricity

Legal considerations i.e. ownership and local authority regulations

Obtain building plans

Assess soil structure

Identify contaminated land

Q36 Explain the term ‘motivation’. (2)

A36

The driving force behind a person’s actions

The way in which people can be persuaded to perform an act willingly

Q37 Describe the motivating factors that could help an organisation improve its health and safety. (6)

A37

Financial rewards or incentive schemes

Praise and encouragement

Discipline

Peer group pressure

Leading by example

Acceptance of responsibility

Involvement in the decision making process.

Q38 Explain the term ‘accident incidence rate’. (2)

A38 The number of accidents per so many (usually one thousand) employees within a defined period of time (usually one year).

Q39 Explain how accident information can be utilised in the promotion of health and safety in the workplace. (6)

A39 Safety committees can use the information to help focus on attention to high risk areas.

It can be used to influence the behaviour of those at risk, i.e. displaying it on notice boards

Reactive monitoring on the management systems’ effectiveness

It can help justify and inform the allocation of resources to health and safety

It can be used on a national scale such as national campaigns

Q40 Give details of the inspection duties that should be carried out to ensure a scaffold erection is safe. (8)

A40

Inspect all components before use
Erect by experienced operatives
Supervise erection by competent person
Consider use for scaffold and type of structure needed
Inspect scaffold every 7 days
Inspect scaffold after inclement weather
Inspection by competent person
Details of inspection in register Form 91

Q41 Outline FOUR sources of information that might be consulted when assessing the risks of a new substance being introduced into a manufacturing process. (8)

A41

Manufacturers' or suppliers' product information
HSE publications such as EH40
Specialist textbooks, journals and research papers
Guidance from trade or professional bodies
Electronic health and safety databases, i.e. the internet

Q42 Outline the FOUR main factors when carrying out a risk assessment that should be considered. (8)

A42 **T.I.L.E**

Task
Individual
Load
Environment

Revision Questions & Answers from NEBOSH IGC Examinations

Element 1: Health and safety foundations

Q1 How would you distinguish between hazard, risk and danger?

A1 Hazard, risk and danger, as applied to health and safety:

Hazard is the potential to cause injury or ill-health (this can include substances or machines, methods of work and other aspects of work organisation).

Risk expresses:

- the likelihood that the harm from a particular hazard will be realised
 - the severity of the consequences if realised, for example:
 - » the number of people who might be affected
 - » the nature of the harm they would suffer
- ... thus, the hazards associated with the leaning wall will translate into a high risk if no steps are taken to fence it off, and into a low risk if appropriate protective barriers and signs are employed.

Demolishing or re-building the wall would of course present new hazards and those responsible for the work would have to undertake a risk assessment before the work commenced.

It follows that both of the factors hazard and risk should be taken into account when undertaking

either a qualitative or a quantitative risk assessment.

Danger is a state or condition in which personal injury is reasonably foreseeable. Danger can,

for

example, be associated with situations such as:

- an employee trapped by a fork lift truck in a narrow gangway where there are no restrictions on access or safe systems of work in force
- an organisation's financial well-being placed at risk because of deficiencies in management systems

Q2 There are various ways of classifying hazards; for example, NEBOSH have categorised hazards as being: physical, chemical, biological or psychological. For each of these four categories, give at least one example of a hazard which would manifest itself in the short term and one example with a long term effect.

A2 Classifying hazards

Short term, ie hazards which represent an immediate danger:

- physical: being struck by a fork lift truck
- chemical: burning from contact with concentrated cleaning fluid
- biological: contagious disease from birds in an aviary
- psychological: traumatic reaction to an accident (this could of course also manifest itself in a longer term)

Hazards which could manifest themselves in the long term are:

- physical: repetitive strain injuries from typing several hours a day for many months or years
- chemical: long term exposure to carbon monoxide by a heavy smoker (CO is also well-known as a short term hazard)
- biological: hearing loss due to noise exposure by a police firearms trainer; you might feel that a case could be made for categorising this as a physical hazard in which case you might prefer to use as an example the skin condition which has developed as a result of long term contact with citrus fruit; if you still think this is not a biological hazard because you would prefer to classify this a chemical hazard, how about long term exposure to tuberculosis for those who work with samples in diagnostic laboratories
- psychological: morale of worker(s) being worn down by harassment

Q3 List and briefly **describe** five or six methods by which potential workplace hazards may be identified.

A3 Identification of workplace hazards

- workplace inspections
- discussions between management and workers

- independent audits
- job safety analysis
- hazard and operability studies
- accident statistics

Q4 Is it the wrongful act which determines the distinction between civil and criminal law?

A4 As we explained in the study material, in determining the distinction between civil and criminal

law you need to look at the outcome(s) of the act in question: if the wrongful act is capable of being followed by what are called criminal proceedings - crime. If it is capable of being followed

by civil proceedings - civil wrong. If the act is capable of being followed by both, it is both a crime and a civil wrong.

Q5 Compose a sentence using the four words ‘guilt’, ‘vicarious’, ‘transferable’ and ‘liability’.

A5 A sentence including the words: guilt, vicarious, transferable, liability ... in criminal law guilt

remains with the person responsible for the wrongful act; in civil law, the liability may be transferable to another (person) who will take over the liability for the damages resulting from another’s wrongful act. This form of liability is termed vicarious liability.

Q6 Civil law is concerned with the rights of individuals and the duties of individuals towards each other; provide a brief **description** of civil law (try to include a mention of law of contract and law of tort).

A6 Civil law

- action brought by an individual
- intended result is compensation for loss suffered
- insurance can / must be obtained to cover liability for damages ('must' because it is a legal requirement for most employers to have employees liability insurance)
- action can be taken only where loss has occurred
- mainly involves common law
- law of contract is concerned with the legal enforcement of 'promises'
- law of tort is concerned with civil wrongs involving nuisance, negligence, defamation, trespass

Q7 In the case of criminal law, certain types of wrongdoing are characterised as being offences against ... against whom or what?

A7 In the case of criminal law, certain types of wrongdoing are characterised as being offences against the state.

Q8 What makes up ‘the body of law’?

A8 The body of law is made up of statute law (written law in the form of Acts and Regulations

etc) and common law (decisions made and principles adopted in previous cases and contained in case-law). As a further question, see if you can fill in the five gaps in the figure on the right (check your answer in the study material).

Q9 Complete these two sentences:

- the requirement in criminal cases is that the defendant is found guilty
- in civil law it is enough that the defendant is found liable for the loss

A9 Completing two sentences:

- the requirement in criminal cases is that the defendant is found guilty beyond reasonable doubt
- in civil law it is enough that the defendant is found liable for the loss on the balance of probabilities

Q10 Briefly **describe** the historical background to common law.

A10 The main points that you should have encompassed in your answer include the fact that the unwritten law was administered by itinerant justices who recorded important decisions in order to help themselves and other justices the next time a similar case arose.

Q11 The boundaries of duty of care are not rigid, they extend not to the ‘average’ individual but to every individual - **explain**.

A11 Boundaries of duty of care; flexible, extending ‘further’ to:

- disabled workers
- workers with a handicap such as colour-blindness or hearing loss
- inexperienced and young workers
- women who are, or might become, pregnant
- workers experiencing stress

Q12 To be successful in an action under the tort of negligence, the following three points have to be satisfied:

- that the defendant owed the plaintiff a
- that the duty of care was breached
- that loss resulted from the breach

You should also know the five requirements that have to be established for a successful action under the tort of breach of statutory duty - check your study material if necessary.

A12 To be successful in an action under the tort of negligence, the following three points have to be satisfied that:

- the defendant owed the plaintiff a duty of care
- the duty of care was breached through negligence
- loss resulted from the breach of the duty of care

Did you remember to check the five requirements that have to be established for a successful action under the tort of breach of statutory duty?

Q13 Explain the function and legal status of an approved code of practice. Give a few examples of ACOPs.

A13 Key points you should have mentioned when discussing ACOPs include:

- examples of good practice
- approved by the HSC under HASAWA powers
- accompany Regulations (provide examples)
- not law but onus of proof in a legal case would be to prove that the practice undertaken is at least as effective as that provided by the ACOP

Q14 Explain the function and legal status of a guidance note.

A14 Guidance notes:

- interpret Acts and Regulations
- help people to achieve compliance with legal requirements

- offer sound technical advice

Q15 Why may health and safety not be seen as a priority by the management of an organisation?

A15 Health and safety has to compete with other management priorities, particularly those associated with the production of goods and services which is the basic rationale of an organisation. It may be seen as an unproductive cost which conflicts with the requirement to keep costs low.

Q16 Define: (i) An accident; (ii) A hazard; (iii) A risk.

A16

- (i) An undesired event resulting in personal injury, damage or loss.
- (ii) A situation with the potential to cause harm or damage.
- (iii) The likelihood that harm from a particular hazard may be realised.

Q17 What two types of hazard are there?

A17 Unsafe conditions and unsafe acts.

Q18 What factors are assessed in determining the magnitude of a risk?

A18 The number of people likely to be affected by the harm from a hazard, and the severity of the harm that may be suffered.

Q19 Identify two responsibilities of workers identified in the ILO Occupational Health and Safety Recommendation 1981.

A19 Workers should:

- (a) take reasonable care for their own safety and that of other persons who may be affected by their acts or omissions at work;
- (b) comply with instructions given for their own safety and health and those of others and with safety and health procedures;
- (c) use safety devices and protective equipment correctly and do not render them inoperative;
- (d) report forthwith to their immediate supervisor any situation which they have reason to believe could present a hazard and which they cannot themselves correct;
- (e) report any accident or injury to health which arises in the course of or in connection with work.

Q20 What are the consequences for an employer of non-compliance with Health and Safety responsibilities?

A20 Criminal – fines; Civil - compensation

Q21 Identify two external and two internal sources of information about health and safety.

A21 External data sources include: National legislation (e.g. regulations); Safety data sheets from manufacturers and suppliers; Government Enforcing Authority publications such as Codes of Practice and Guidance Notes; Manufacturers'/suppliers' maintenance manuals; National/International standards; Information from local safety groups; Information from trade associations; Information from journals and magazines

Internal data sources include: Information from accident records; Information from medical records and the medical department (if you have one); Information from company doctors; Risk assessments; Maintenance reports; Information from joint inspections with safety reps; Information from audits, surveys, sampling and tours; Information from safety committee minutes.

Q22 What are the organisational requirements for effective health and safety management?
A22 There should be a framework of roles and responsibilities for health and safety allocated to individuals throughout the organisation, including the appointment of specialist staff and ensuring that general management roles and arrangements address health and safety issues.

Q23 What is the role of evaluation?

A23 To ensure that the organisational arrangements, health and safety standards and operational systems and measures are working effectively and, where they are not, to provide the information upon which they may be revised.

Element 2 Policy

Q1 What is the official name of what we commonly call ‘the safety policy’?

A1 The full name of ‘the safety policy’ is ‘the general statement of policy’.

Q2 What are the three key elements of a safety policy?

A2 The three key elements of a safety policy are generally summarised as:

- general statement of intent, dated and signed by the owner or chief executive
- organisation, details of who is responsible for doing what with regard to health and safety
- arrangements for implementing the policy; in practice these are often divided as follows:
 - » general arrangements
 - » specific arrangements, which apply only to specific employees

(Remember this is the usual ‘three element’ interpretation of the HASAWA safety policy requirements, one which presumably has received acceptance by HSE as we have never seen any adverse comments from them.) You should be able to give a few examples of both the general and the specific arrangements - check in your element NGC1/2 study material.

Q3 Complete the following bullet points which are intended to summarise an organisation’s responsibilities:

- accept responsibility for the health and safety of by the identification, elimination and control of
- provide sufficient resources to
- monitor the application of the policy and
- provide an authoritative
- demonstrate a clear commitment to communicate

A3 As you will appreciate, the following concern the general statement of intent of the policy:

- accept responsibility for the health and safety of employees and others by the identification, elimination and control of hazards
- provide sufficient resources to fulfil the policy
- monitor the application of the policy and revise it as necessary
- provide an authoritative signature
- demonstrate a clear commitment to communicate the contents of the policy to all employees

Q4 (Looking forward to units IGC1/7 and 8.) Under the two main categories of ‘proactive’ and ‘reactive’, **list** some factors which could be used to measure the effectiveness of the policy.

A4 Factors used to measure the effectiveness of the policy include:

- proactive monitoring (audits, inspections, surveys)
- reactive monitoring (accidents, dangerous occurrences, near misses, ill-health)

As the second part of this question, you should be able to provide a brief explanation of the limitations of reactive statistics of health and injury - why they should never be used as the sole measure of the effectiveness of the safety policy. You should also be able to explain why all companies are bound by law and good practice to fully investigate any accidents and ill-health that do occur.

Q5 Briefly **explain** the role of self-regulation in health and safety.

A5 Self-regulation: employers must examine their own organisation in order to identify the health and safety risks and introduce measures to eliminate or control them.

A safety policy is a classic example of self-regulation. As we have stressed, it is crucial that a safety policy is developed internally (with outside assistance if necessary) and not copied from another organisation.

Q6 **Explain** the concept of benchmarking in the context of health and safety.

A6 Benchmarking - it will be interesting to see if NEBOSH do ask any questions using this word. As we explained in the study material, standards which define exposure limits to both physical agents such as vibration, noise, ionising radiation (IGC2/7) and to chemical agents (IGC2/6) are in effect limited forms of benchmark and have been used for many decades.

In the way that 'benchmarking' is now being used (it would perhaps not be wrong to say 'being pushed') in health and safety implies that a range of factors (as per question 4 above) are to be

used to give a benchmark measure of the overall state of health of an organisation in much the same way that overall ratings are now being given to hospitals, schools, postal services,

transport performance and so on. It is beyond our Certificate needs to make further comment; no doubt you will have ideas of your own, both for and against, the present trend to quantify everything.

Q7 **Explain** the factors involved in reviewing a companies health and safety policy.

A7 Reviewing the health and safety policy

The main point we have tried to make is that there can never be a situation (short of the closure of company) in which the policy does not have to be reviewed - for a start, time passes.

Other triggers for review and revision will be:

- organisational changes
- introduction of new processes, new facilities and so on
- legislative changes
- results of both pro-active and re-active monitoring exercises

Q8 Briefly **outline** the sort of information that might be stored in the company management system.

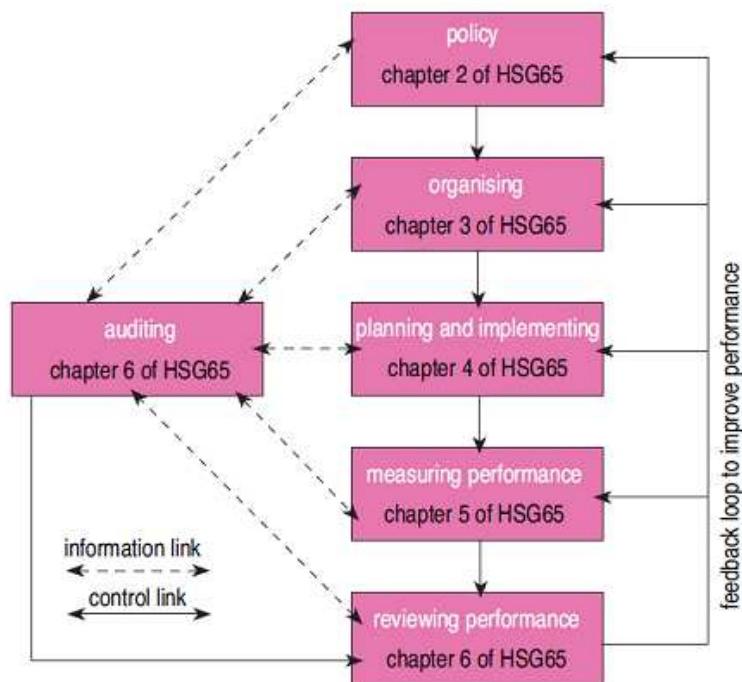
A8 The company health and safety management system (in NGC1/1 we make the first mention of this subject to which we will frequently return). Above all the information stored and the practical mechanism used for the storage (off-the-shelf computerised record-keeping

system, card index system, networked system ...) must be appropriate for the needs of the company; you will no doubt be able to add to:

- health and safety audits, inspections etc
- training records
- accident, ill-health, incident records
- details of equipment testing
 - » in-house testing of portable electrical appliances etc
 - » external expertise required for the testing of lifts, steam boilers
- register of external expertise

Q9 HSG65. In IGC1/2 we said that you must learn the outline structure of this HSE publication; complete the structure of this figure (if you happen to remember the HSG65 chapter numbers as well, even better):

A9 HSG65 structure and thus a reflection of the structure of the first five elements of the NEBOSH Certificate, ie IGC1/1–5.



Q10 Why might the health and safety policy of two organisations, both undertaking similar work, be different?

A10 Because the policy is a reflection of the particular circumstances of each organisation. Thus, any variations in size, nature and organisation of operations, etc., will mean that the health and safety policy will also vary.

Q11 What are the three key elements of a health and safety policy?

A11 The general statement of intent, organisation and arrangements.

Q12 By whom should the policy be signed?

A12 A senior Director or the Chief Executive Officer, indicating the organisation's commitment at the highest level.

Q13 What does a safety organisation chart show?

A13 The hierarchy of roles and responsibilities for health and safety, and the lines of accountability between them.

Q14 What responsibilities do all workers have relating to health and safety?

A14 To act responsibly and safely at all times, and to do everything they can to prevent injury to themselves and to fellow workers.

Q15 What forms the base for the plans for the systems, procedures and other measures required to put the health and safety policy into effect?

A15 Risk assessments.

Q16 State the three main forms of communicating health and safety information to staff.

A16 The three main methods of communicating health and safety information are the use of written procedures, provision of instructions and provision of appropriate training.

Q17 What are active monitoring systems?

A17 Active monitoring systems are those which seek to identify deficiencies in current arrangements before any resulting accident. They include testing, inspections and consultation procedures, as well as management controls to ensure compliance.

Q18 In what specific circumstances should a policy review be held?

A18 The circumstances which should give rise to reviews, either of general policy or specific aspects of it, are:

- Changes in the structure of the organisation, and/or changes in key personnel
- A change in buildings, workplace or worksite
- When work arrangements change, or new processes are introduced
- When indicated by a safety audit or a risk assessment
- Following government enforcement action or as the result of the findings from accident investigations
- Following a change in legislation
- If consultation with workers or their representatives highlights deficiencies
- If requested by a third party.

Element 3 Organising for health and safety

Q1 Suggest the type of information that an employer might require from a prospective contractor.

A1 Information that an employer might require from a prospective contractor ... in the case of a small contract, it would be sensible to ask for:

- references
- details of work recently undertaken
- membership of trade or professional bodies - this may be compulsory:
- copies of their safety policy and, perhaps, relevant working procedures

In the case of a large contract, the employer should additionally be requesting:

- accident statistics and reports
- full procedural details of how the proposed work will be undertaken, including arrangements for subcontractors
- ‘profiles’ of the key members of the potential contractor’s staff

- information on the training and experience of those who will be undertaking the contract work
- feedback from the contractor regarding the information that they might need from you, the employer

Q2 Describe three particular hazards associated with contract work.

A2 Contractors and contract work represents a particular working challenge because:

- contractor's personnel may not be familiar with the processes and procedures
- contract work will almost always involve activities and relationships outside the normal activities of the organisation:
 - » demolition
 - » repair
 - » commissioning new equipment, and so on
- the contractor's personnel may change from day to day, particularly if sub-contractors are used

Q3 Can you provide a **definition** of 'communication' and give some practical workplace examples of the causes of poor communication.

A3 In our text, we defined communication as:

The process by which information is passed between individuals and / or organisations by means of previously agreed symbols.

It does not slip easily off the tongue does it? Non-the-less, it is a reasonable definition in that it

does introduce all the key words or concepts:

information transfer ... individual or organisation ... agreed symbols / 'language' / system

As we have said before, a definition can be a good starting point because, by embellishing and

expanding upon your definition, you can generate a good answer.

As far as causes of poor communication (a NEBOSH favourite question) are concerned, you should be thinking in terms of a communication model involving:

- Generation
- Transmission
- Reception

and your answer can provide examples of failures at these three stages:

- mis-heard instructions in a noisy environment (transmission)
- poor instructions for the assembly of a new piece of kitchen equipment (generation)
- clear, well laid-out instructions on kitchen equipment misunderstood by someone who is not qualified to be assembling the equipment (reception, with other communications failure[s] down the line being the cause of an unqualified person wrongly wiring up the waste disposal unit on the sink)

You should be able to add many more examples involving people with poor hearing, tired and

stressed workers, electronic failures and so on - refer back to the study material if you need.

Q4 In a couple of sentences **explain** why failures in inter-departmental communications are quite common.

A4 Inter-departmental communications failures (how long have you got?), some of many causes:

- hostility / competitiveness leading to communications being wilfully or unintentionally mislaid

or ignored

- different communications systems being used by various departments: paper, electronic, verbal ... the problem being the 'translation' from one system to the other - an 'urgent action required' note on a piece of paper may have no electronic equivalent
- different departments have different priorities

Q5 Define and briefly **describe** some forms of communication media

A5 Be careful with this fairly common question - it does not say 'forms of communication', it says 'forms of communication media'. The implication (and the evidence of examiner's comments) is that they are looking for words on media such as:

- posters
- newsletters
- electronic notice boards
- written work instructions, and so on

It seems that the word 'media' in the question precludes the mention of forms of communication

such as normal conversation / phone calls etc. You could of course argue for the inclusion of conversation etc and our approach in the exam would be to write something like this:

In addition to the most common form of communication (namely speech) media with particular

uses in health and safety include and so on

Q6 Describe the value of the large site entrance display board giving details of the company's accident record.

A6 Site entrance display board

"The accident record must be good or they wouldn't shout about it" - an immediate reaction on the part of visitors entering the site and a powerful tool in promoting the safety culture in the organisation; you can be pretty sure that workers will soon notice if the figures shown are massaged in some way.

Q7 Describe some common forms of written health and safety communication.

A7 Forms of written health and safety communication might include:

- company safety policy
- accident reporting
- permit to enter, permit to work
- written system(s) of work
- inter-departmental memos
- minutes of meetings

Please note that although you may know of companies where (say) the minutes of meetings are

only distributed electronically, this is no reason to miss them out of your answer.

Q8 Describe some sources of information available to the health and safety professional

A8 Sources of information available to the health and safety professional

A one word answer would of course be the internet, but the examiners will clearly be wanting you to describe some of the sources available through the internet:

- HSE publications (free downloading of some HSE material)
- commercial windows into sources such as research reports, HSE publications, legislation, equipment suppliers; these commercial windows ('portals' seems to be the popular new term) are offered by a number of companies: Technical Indexes, HSE Direct,

- internal accident data and reports
- accident reports from other companies - particularly in the case of higher risk environments (or
should we say higher hazard environments? ... discuss)
- commercial auditing, inspection and record-keeping packages (there are many from which to choose); these computer-based packages can help direct and inform the monitoring and inspection activities of the safety professional
- information on chemicals - hazard data sheets etc
- exhibitions
- journals

Q9 What legal rights do safety representatives have?

A9 The legal rights of safety representatives include the right to:

- represent employees in consultations with the employer
- investigate complaints, potential hazards and accidents and make appropriate representations to the employer
- carry out their own inspections of the workplace
- consult with, and receive information from, inspectors
- attend relevant safety meetings

Q10 What must the employer provide for safety representative(s):

A10 For safety representatives, the employer must provide:

- adequate facilities (room, phone, access to typing facilities ...) and time
- access to the internal communications system
- training to enable performance of duties (time off for training)

Q11 Outline the membership of a typical safety committee of a medium-sized organisation.

A11 Safety committee membership

- safety representative(s)
- production manager
- line manager(s)
- director with specific health and safety responsibilities
- company doctor/nurse

Q12 Suggest some factors which will determine the effectiveness of a safety committee.

A12 Some of the factors upon which the effectiveness of the safety committee's work will depend include:

- level of organisation of the meetings and the associated activities such as booking rooms and sandwiches and parking spaces
- realistic, previously agreed agenda and prompt circulation of accurate and clear minutes, including unambiguous details of actions to be taken
- quality of the chairing of meetings
- competence and expertise of committee members and the technical support available to them
- status of the committee

Q13 Checking a potential consultant's credentials - how would you go about investigating their competence, what sort of questions would you ask?

A13 Assessing a consultant

Be prepared to spend time discussing matters with the prospective consultant. The sort of questions to which you need answers include:

- qualifications and experience of consultant and associated staff
- what back-up is offered, particularly if the job broadens as new problems are identified
- professional indemnity insurance
- are written reports part of the service?
- previous contracts, references
- what is the nature of the follow-up provided?

Q14 Outline typical duties of employers to workers.

A14 The general duties of employers are:

- Provision/maintenance of safe plant/equipment and a safe system of working
- Provision of adequate instruction, training, supervision and information necessary to ensure the health and safety at work of workers
- Provision and maintenance of a safe workplace (including a safe way of getting to and from that place of work).

Q15 Outline common duties of workers.

A15 The two general duties of workers are:

- To take reasonable care for their own health and safety and that of other persons who may be affected by their acts or omissions at work
- To co-operate with the employer so far as is necessary to enable the employer to fulfil his legal obligations.

Q16 What are the responsibilities of employers to people who are not their workers?

A16 Employers must make adequate provision to protect third parties from harm as a result of their work activities by:

- Conducting their undertakings in such a way as to ensure that people not in their employment who may be affected by their activities are not exposed to risks to their health and safety
- Giving people who are not their workers sufficient information regarding the undertaking as might affect their health and safety; for example, details of potential hazards.

Q17 Where business premises are rented, is the employer responsible for health and safety matters relating to points of entry to and exit from the workplace?

A17 It would depend on the terms of the tenancy agreement. Responsibility lies with the person who may be said to control the particular aspect of the premises.

Q18 Outline the areas of responsibility placed on people in the supply chain for the articles and substances which they supply to workplaces.

A18 All people involved in the design, manufacture and supply of articles and substances, insofar as it relates to their own role, should:

- Ensure that the articles and substances, are reasonably safe and without risks to health at all times at the workplace
- Carry out such testing as may be necessary for the performance of the above
- Take reasonable steps to ensure that the recipient of the article or substance is provided with adequate information about the article/substance (this might cover intended use, limitations, inherent hazards as well as how to use it properly)

- Keep the recipient up to date if new information comes to light regarding additional (significant) risks arising from the article/substance

Q19 Outline the responsibilities of the client and the contractor where a contractor is working in the client's own workplace.

A19 In general terms, the client would be responsible for the workplace and environment, and the contractor for the job, with each being responsible as the employer to his own workers.

Q20 How may employers consult workers?

A20 Directly, or through representatives.

Q21 What are safety circles?

A21 Safety circles are small groups of workers who meet informally to discuss safety problems in their immediate working environment.

Element 4 Promoting a positive health and safety culture

You will have seen the first five questions in the IGC1/4 study material. As we explained, they are deliberately worded so that they sound similar to one another. This is because we know from

experience that, over the years, NEBOSH have set many superficially similar communications questions which are actually asking different questions.

Q1 Outline the various methods which may be used to convey the health and safety message in the workplace.

A1 Conveying the health and safety message in the workplace.

The immediate problem that you would have if this were an 8 mark (9 minute) question would be not to run out of time (indeed, very similar questions have appeared as 20 mark, 30 minute questions). Your answer to this question should draw upon what you covered in section 7 of unit 4

Effecting cultural change.

You could not do better than quote the syllabus requirements:

- securing commitment of management
- promoting health and safety standards by leadership and example
- use of competent personnel with relevant knowledge, skills and work experience
- effective communication within the organisation:
 - » safety committees, notice boards ...
- training

Obviously, in your answer you should fill out the above as much as time allows; the second part of your answer could briefly refer to the activities necessary to promote a positive health and safety culture which are defined in HSG65 as:

- control
- co-operation
- communication
- competence

(Remember what we said about the HSE's somewhat tentative use of c c c c ...)

Q2 Outline the type of media that might be used to convey the health and safety message in the workplace.

A2 Media ... in the workplace.

Don't waste time giving the examiners the answer to the previous question, that is not what they

asked; they want to know about media so tell them about the pros and cons of:

- entrance to site display boards
- use of posters
- notices, charts, leaflets, newsletters
- safety competitions
- videos

Q3 Outline some factors which might interfere with verbal communications in the workplace.

A3 Interference with verbal communications.

Often a good idea to start an answer with a definition

{ Process by which information is passed between individuals and / or organisations by means of

previously agreed symbols. }

...because this provides a very good peg on to which you can hang the remainder of your answer, via examples such as those we gave in the study material.

Q4 Outline factors which might interfere with various forms of communication in the workplace.

A4 Interference with various forms of communication.

Obviously an appropriate answer will need to include the verbal communication problems addressed in the previous question but will need to encompass a lot more. The answer again should still usefully start with a definition of communication (you should be able to make up your own) and then address the communication problems associated with:

- e-mail and other electronic forms of communication
- formal verbal communication in meetings - effective use of minutes
- casual verbal communication - discrete and potentially very valuable, but unlikely to be recorded
- ... and so on ... the problems associated with all the other forms of communication which we mentioned in the study material: newsletter, posters ...

Q5 Outline the advantages and disadvantages of basing workplace communications on electronic

systems such as e-mail.

A5 Electronic communication

Again, start with explanations: what you would encompass under this heading? A definition of

communication would again be very valuable because it would provide you with a starting point

for discussing computer compatibility, feedback, storage of information, access to a computer terminal (a real trump card if the intended recipient does not have easy access to one).

Q6 The word 'appropriate' crops up all the time on the subject of training. You should be able to provide simple examples of, and explanations for, training programmes that would be appropriate for:

- young persons
- more mature persons
- persons due for promotion
- managers

A6 Young persons lack of experience and, at times, poor co-ordination; importance of mentor(s) (make sure you can provide examples of just what a mentor would provide)

The HSE recommend employers to:

- assess the risks to young people, taking into account their inexperience, immaturity and lack of awareness of existing or potential risks
- address specific factors in the risk assessment
- provide information to parents of school-age children about the risks and control measures
- exclude young persons from certain work activities

The key is to fully evaluate any risks to which young people may be exposed before they are allowed to start work. Full consultation must take place between the appropriate managers to ensure the creation of an effective and relevant training programme.

More mature persons

The key question to be asked in real life - and thus the key to you providing a satisfactory answer in an examination - is to discuss the reasons why training is needed for our 'non-young' person; these might include:

- relocation to new premises
- introduction of new equipment and/or new processes, changes to operating procedures
- influx of new staff
- new legislation
- introduction of improved systems of work
- poor accident records
- desire to reduce insurance premiums
- reports from auditors, risk assessors and loss adjusters
- visit from enforcement authorities

Persons due for promotion

This training requirements for this person may be seen as an extension of the 'more mature persons' category above. We refer you back to the study material and in particular the question

about John, who is being considered for promotion, and the problems he might face. This is actually a classic NEBOSH Diploma question in that it requires the candidate to take a wider look at a situation but as a good Certificate student you should be able to come up with some good responses.

Training the manager

Again, you would perhaps be well advised to start your response with a series of reasons why the manager needs training ... this could, and perhaps should, encompass common management

failings (as given in the study material: failure to understand legal responsibilities ... etc). You will be aware that the law is starting to change to include, for example, the offence of corporate

manslaughter - managerial responsibilities are clearly of the utmost relevance here.

In developing a management (health and safety) training programme, consideration should be given to:

- organisational matters such as: company size, structure and siting; nature of in-house professional expertise (company doctor, nurse, occupational hygienist etc)
- the requirements of the manager's job: legislation, responsibility for risk assessments and

implementation of control measures; means of, and effectiveness of communication channels

Q7 A favourite NEBOSH question in the past at both Certificate and Diploma level involved the candidate being asked to imagine and describe how they would run training course on such and such a subject. As we mentioned in IGC1/4, the revised syllabus makes very little mention of the practicalities of running a course. However, on checking we found that the previous syllabus also made little mention of this, but there were, as we said, fairly frequent questions on it. Accordingly, we feel we should prepare you, in case ...

Careful preparation and generous provision of videos and other audio-visual material is no guarantee of a stimulating and useful training course. However, what we can say is that all but the most inspirational trainer will need the preparation and the audio-visual aids and when you answer a ‘how would you run a training course’ question then you must demonstrate to the examiner that you do indeed know about all the tools and techniques which are available to the trainer. Accordingly, **describe** some techniques which might be available to the trainer.

A7 Techniques that might be available to the trainer:

- commercial videos (with all the associated questions of relevance to your company, purchase / hire, when was video made, etc)
 - in-house videos - may cause more amusement than a commercial video but may well be more effective; in particular they do carry with them an aura of management concern and an implied suggestion that ‘if you could do better ...’; and indeed an improved version of the video may come about this way
 - poster displays (off-the-peg or in-house, or a combination)
 - ‘slide’ / projector display, perhaps using a package such as Powerpoint
- ... you will no doubt be able to add many more items to this list. What we would say is that if you do get such a training resources question in the examination, make sure that you get the balance of your answer correct; if for example, the question asks how ‘four training aids of your choosing might be used in the provision of a training course’, then do as required and describe the use of four aids (video, role play ...), don’t throw away marks by listing fifty different training aids but fail to describe how they might be used.

Q8 Another favourite NEBOSH question, really an extension of the ‘techniques available to the trainer’ question is concerned with the pros and cons of poster displays, notice boards, (e-mail) newsletters, safety forum (what is the plural?) in getting over the health and safety message. A question such as this could probably elicit a reasonable answer from someone with no health and safety knowledge at all. Obviously it would be better still if your answer had a health and safety flavour to it - accordingly, think about how you would flavour your answer with ‘essence of health and safety’.

A8 Again, we will spare repeating all the points we made in the study books; here are just a few

ideas for ensuring that your answer has a health and safety flavour to it:

Poster displays - mention of the products of HSE and commercial suppliers such as ARCO (do

name-drop in the way if you know about them); ‘customising’ of commercial posters by overprinting or siting them in tandem with in-house material which gives more specific information; value of creation of in-house display material.

Notice boards - again, wide availability of informative material from HSE etc. Imaginative use of notice boards, including frequent changes of the display; dividing up notice boards with different individuals or groups having responsibility for different areas on the board(s). Newsletters (e-mail or hard copy) - question and answer sections can, in larger organisations, almost run themselves; links in the newsletter to other sources of health and safety information, perhaps on the web.

Safety forum - here you would need to mention the sort of items that would be on the agenda (accident reports etc) and the make-up of the forum.

Q9 Outline the key components of an induction training programme.

A9 Induction training programme

Again, you can't go wrong starting with a definition:

{ Induction training should provide a systematic, planned programme designed to familiarise new employees with their company ... particular reference to the environment in which they will work. }

Don't underestimate the value of placing such a definition at the start of an answer; in an examination situation, a definition such as the above would probably immediately give you 2 or 3 marks (in an 8 mark question). Immediately the examiner is made to feel that they are in the

presence of someone who knows what they are talking about (assuming the definition is correct)

of course). You can then add to your definition giving you a richer answer, briefly mentioning for example:

- characteristics of new recruits
- details of the induction programme: 'first morning', one month later and so on:
 - » first morning: ppe, fire drill, canteen, first aid, introductions to managers, safety reps etc
 - » one month later: focus on accident prevention (you should be able to give more detail)
- appropriate records to kept, to be signed by employee and manager

Q10 Explain briefly what is meant by the following human factors:

- attitude
- motivation
- perception

A10 Human factors

Attitude ... attitude to: authority, to the implementation of systems of work, wearing of ppe, recording the results of activities undertaken.

Also look at this the other way round, ie the influence of the culture of the workplace on the attitude of the individual ... attitude of individual ↔ safety culture

Perception ... the picture or view that an individual has in their mind of the environment and of

the things which are happening in that environment. How does the individual's view coincide with reality? Is there a serious mismatch? Factors which influence an individual's perception:

- sensory defects - deafness, colour blindness
- background factors such as experience and peer group pressure
- environmental factors - noise, heat, drugs

Motivation ... factors which direct or drive the way in which a person acts; relationship between

motivation and attitude.

Depending on how a ‘human factors’ examination question were to be worded, it might also be

appropriate to include a few brief note on skill, and physical and mental capability to add to attitude, motivation and perception.

Q11 Give some examples of motivation that might usefully be used in the workplace.

A11 Examples of motivation ...

- encouragement
- incentives
- involvement
- demonstration of commitment from management
- disciplinary action (remember the implications of such ‘negative’ motivation)

To this list should be added training, a crucial ingredient in motivating staff and in providing

the

skills necessary to undertake work in safety.

Q12 When considering the prevention of human error, we looked at three specific areas:

- the organisation
- the job
- personal factors

You should be able to write a paragraph under each of these headings; see if you can.

A12 The prevention of human error

Factors you should have mentioned include the overwhelming importance of the organisation

- good discipline, motivated and committed work-forces. Key points under the three suggested headings include:

The organisation

- commitment from (top) management; the ‘safety policy’
- examples of absence of commitment of management (you choose)
- what happens when hazards are reported (you can link this to the previous item)
- system for monitoring safety: identifying, investigating and correcting (you can’t go wrong in

mentioning HSG65)

The job

- matching the job to the individual by the application of ergonomic principles
- design and layout of the workplace taking into account the characteristics of the task: repetitive, physically demanding etc
- task analysis of the activities required of the worker, for incorporation into a wider job safety analysis.

Personal factors

- personalities, habits, attitudes to work, skills (relate this back to NEBOSH’s favourite human factors: attitude, motivation and perception)
- training and backing from supervisors and managers; building up confidence

Q13 Define health and safety culture.

A13 Your definition should cover the main points of the definitions given in the unit:

– From IOSH: “The characteristic shared attitudes, values, beliefs and practices of people at work concerning not only the magnitude of risks that they encounter but also the necessity, practicality, and effectiveness of preventive measures.”

Q14 What is the difference between active and reactive indicators of a health and safety culture?

A14 Active indicators show how successfully health and safety plans are being implemented, mainly through the extent of compliance with systems and procedures.

Reactive indicators show the outcomes of breaches of health and safety systems and procedures, mainly through accidents, etc.

Q15 Why are low accident rates not a good indicator of a positive safety culture?

A15 A low incidence of accidents may conceal a high number of near misses, or even a lack of reporting. In low risk organisations, a very low rate of accidents would be expected and any accidents may be a cause for concern. It is not the accident rate itself which indicates the state of health and safety in the workplace, but why those accidents take place.

Q16 Why do accident rates increase during periods of organisational change?

A16 A lack of focus on health and safety by management and staff, increased pressure of work on individuals during the change period, uncertainty over the outcome of change causing demotivation.

Q17 List the main internal and external influences on the approach to health and safety in an organisation.

A17 The main internal influences are management commitment, the demands of production, the form of communication, levels of competence and worker representation

The main external influences are public opinion and expectations, legislation, trade unions and insurance companies.

Q18 What is perceptual distortion and how may it arise?

A18 Perceptual distortion, as applied to risk, occurs where the risk is not recognised for what it is. This may occur because of a failure to notice the hazard or a failure to interpret it as a risk.

Q19 What is the difference between an error and a violation?

A19 An error is an action or decision which was not intended, involving a deviation from an accepted standard and leading to an undesirable outcome. A violation is a deviation from a rule, procedure, instruction or regulation.

Q20 How do an individual's peers exert influence over his/her behaviour?

A20 Through the influence of groups and group norms.

Q21 Why is encoding such a key element in the communication process?

A21 In order for the communication to be effective, the message at the centre of the communication must be understood by the receiver in the way intended by the sender. The process of encoding (and then decoding) involves putting the message into words, gestures and symbols, etc., which the receiver will understand, so this is central to the effectiveness.

Q22 Is feedback essential for effective communication?

A22 No. Feedback opportunities may help, but are not essential. Most written communication is one-way and this does not, in itself, make that form of communication ineffective.

Q23 What are the main advantages and disadvantages of both written and oral forms of communication?

A23 The following table shows the advantages and disadvantages of the two forms of communication.

	Advantages	Disadvantages
Written	Permanent record More careful compilation Widely distributed with ease	Expensive Impersonal Lack of feedback may lead to misunderstandings
Oral	Immediate provision of information Immediate feedback Personal and direct	Time consuming and expensive Impermanent Opportunities for misinformation

Q24 How are graphical (picture) symbols used in safety communications?

A24 Predominantly in signs.

Q25 How may safety briefings be supported?

A25 By the use of procedural manuals and by reinforcing signs.

Q26 What are the main functions of committees and working groups?

Q26 The main functions of formal meetings are to:

- Provide members with an opportunity to exchange views and information
- Make recommendations for action to a higher organisational level
- Generate ideas or solutions to problems
- Make policy and other decisions for the organisation.

Q27 What should be the first priority in induction training?

A27 To set out the general instructions and procedures to be followed for safe movement around the workplace and what to do in the event of a fire or accident.

Q28 Apart from induction, when should training always be provided?

A28 Whenever there is a change to the job or tasks which workers are expected to perform, and when new legislation is introduced.

Element 5 Risk assessment

Although element 5 forms one of the key-stones of the whole NEBOSH Certificate syllabus, we

have not asked too many questions about risk assessment as this is of course a subject which reoccurs throughout unit NGC2, as well as in the separate study material for the risk assessment part of the examination (NGC3).

Q1 List the five categories of ‘incident’ defined by NEBOSH (and other authorities).

A1 NEBOSH list the following ‘incidents’:

- ill-health

- injury accident
- dangerous occurrence
- near-miss
- damage-only

Q2 Outline, with examples, a typical categorisation of health hazards (note: just, health note, not health and safety).

A2 Categorisation of health hazards; as we explained, health hazards are the subject of NGC2/6 and IGC2/7, covering:

- physical health hazards
 - » noise
 - » vibration
- chemical health hazards
 - » toxic gas (chlorine)
 - » agents which attack the nervous system (lead, mercury)
- biological health hazards
 - » allergic reactions to spores on agricultural products
 - » HIV
- ergonomic health hazards
 - » aches, strains
 - » problems associated with visual display units
- psychological health hazards
 - » stress, lethargy, hostility

Q3 Explain the difference between acute and chronic effects. How do you classify allergic effects?

A3 Acute and chronic effects

An acute effect usually involves a rapid response (seconds, minutes, hours) to high levels of exposure. Unless the victim dies, complete recovery from an acute effect is usually to be expected. (Make sure that you are able to provide examples of both physical and chemical acute effects. Most biological agents - for example legionella - will obviously give an acute effect or non.)

Chronic effects involve long-term response to exposure, in some cases quite low levels of exposure. Recovery from a chronic effect is not to be expected.

Allergic reactions, in which an individual becomes sensitised to a particular chemical or biological agent (dried animal bedding) cannot be put into either the acute or chronic category - in a sense they belong in both.

Q4 Very briefly **explain** how the results of a risk assessment can be prioritised.

A4 The results of the risk assessment must be prioritised:

- high priority, immediate action required
- medium priority, action required within weeks
- low priority, action required within months

Q5 What are the five steps ‘to assess the risks in your workplace’ as given in INDG163 5 steps

to risk assessment and other HSE publications.

A5 The five steps ‘to assess the risks in your workplace’ given in INDG163 and other HSE publications are as shown here:

How to assess the risks in your workplace

Follow the five steps in this leaflet:

STEP 1: Look for the hazards

STEP 2: Decide who might be harmed and how

STEP 3: Evaluate the risks and decide whether the existing precautions are adequate or whether more should be done

STEP 4: Record your findings

STEP 5: Review your assessment and revise if necessary

Q6 Why is the distinction between hazards and risks so important to health and safety management?

A6 Hazards will always exist to some extent in the workplace and usually it is not possible to eliminate them. Risk can be controlled and reduced. This is the central point of health and safety management.

Q7 State the purpose and objectives of risk assessment.

A7 Risk assessment is an examination of what could cause harm to people as a result of work activities in order that appropriate precaution may be put in place to prevent harm. Its overall aim is to ensure that no one suffers harm as a result of workplace activities.

Q8 What is the basic calculation for risk?

A8 Risk = Frequency × Severity.

Q9 What do accident triangles show?

A9 Accident triangles show the relationship between numbers of accidents with different outcomes. They give the numbers of less serious accidents which occur for each occurrence of the most serious.

Q10 What limitations are there on the use of accidents statistics to draw comparisons with other workplaces or the industry as a whole?

A10 The basis on which the statistics were prepared may not be the same and the workplaces themselves may not be directly comparable. The larger numbers of accidents included in statistics for an industry as a whole are likely to provide a more accurate reflection of reality than the smaller numbers involved in one particular workplace.

Q11 What are the two ways in which accidents may be classified?

A11 By the cause of the accident itself or by the cause of the injury arising from the accident.

Q12 What are the main causes of accidents?

A12 Human failings.

Q13 State the four forms in which chemical agents may be encountered.

A13 Liquids, dusts, fumes and mists.

Q14 What is the difference between an acute and a chronic effect?

A14 An acute effect is the response induced by a single dose or limited exposure to an agent, and a chronic effect is the long-term response, usually after repeated exposures to a sub-lethal concentration of the agent.

Q15 State the four ways in which physical hazards may cause harm to a person's general health.

A15 Physical hazards cause harm to the body through mechanical, radiation or thermal sources or because of ergonomic conditions.

Q16 Into what categories are accidents which result in injuries caused by falling divided?
A16 Slips, trips and falls on the same level, and falls from a height.

Q17 State the five steps involved in risk assessment.

A17 Identifying hazards, identifying who might be harmed and how, evaluating the risks arising from the hazards and deciding if existing precautions are adequate or more should be done, recording the findings, and reviewing the assessment.

Q18 Apart from operators, what particular staff groups require special consideration during a risk assessment?

A18 Maintenance staff, cleaners, young workers, lone workers, new and expectant mothers and disabled staff.

Q19 What techniques are used for identifying hazards?

A19 Inspection, job/task analysis, analysis of incident data, examination of legislative requirements and associated guidance, examination of manufacturer's information.

Q20 What is residual risk?

A20 Residual risk is the level of risk remaining after the application of safety precautions. It should be only low-level, tolerable risk.

Q21 What factors are used to evaluate risk?

A21 The likelihood of harm occurring and the severity of that harm.

Q22 State the three principles which underlie the order of the general control hierarchy.

A22 Elimination of the hazard, using physical or engineering controls to reduce the risk at source and provide protection generally, and control of the person by job design, management or (as a last resort) personal protective equipment.

Q23 What conditions might trigger a risk assessment review?

A23 Factors which would require a risk assessment include changes in legislation or control measures, a significant change in work practices and processes, or installation of new machinery and equipment.

Element 6 Principles of control

Q1 The steps to a safe system of work will encompass the following, What are the steps?

A1 The steps to a safe system of work:

- assess the task
- identify the hazards
- define safe methods
- implement the system
- monitor the system

Q2 In developing a safe system of work, job safety analysis may be undertaken, breaking a task down into its component parts. What are the basic procedure for job safety analysis:

A2 The basic procedure for job safety analysis:

Step 1 Identify the job to be examined

Step 2 Break the job down into its chronological step-by-step component parts

Step 3 Critically observe and examine each component part of the job to determine any hazard

Step 4 Determine whether there is a significant risk from the observed hazard, to people or plant

Step 5 Develop suitable control or protective measures to eliminate or reduce the risk of danger to people and plant

Step 6 Produce written safe systems of work and job safety instructions

Step 7 Provide the necessary training to operate the safe system of work

Step 8 Review safe systems of work at planned intervals to ensure that they continue to be relevant and used

Q3 List five or six situations in which a permit to work will be probably be required.

A3 Situations where a permit to work will be probably be required:

- entry into confined spaces
- work at heights
- high voltage electrical work
- complicated maintenance work
- demolition work

• work in environments which present considerable health hazards:

» radiation work

» conditions of severe thermal stress - repair work in kilns, food freezer storage systems

» work involving toxic dusts (asbestos), gases and vapours (often in confined spaces)

• lone worker (remember that we discussed the various ways in which this term is used)

You should be able to describe just how a permit to work system works, perhaps with the aid of a

simplified figure showing the layout of a permit to work form for a particular environment – confined space, hot work etc.

Q4 Outline a few of the problems that might be involved in changing shifts in hazardous working environments.

A4 As we pointed out, the causes of some of the very worst accidents have revolved around the

problems of shift changes; another example could be the Herald of Free Enterprise disaster where nearly two hundred lives were sacrificed because of the combination of incompetent unqualified shore-based ‘management’ and so-called systems of work on board the ship which

involved bizarre communications arrangements such as shoes left outside sleeping cabins as the sign that on-coming staff needed to be woken ready for the next shift.

Q5 Competence; it would seem unlikely that NEBOSH would ask a specific question on this, but you should certainly have an understanding of the problems involved in defining competence.

A5 A brief essay on competence would encompass the often-used but clearly not entirely satisfactory circular argument that ‘a person is considered as competent to undertake a certain function if his work experience and the training he has undertaken enable him to properly fulfil the duties involved in’ and so on. Your answer should also encompass the fact that many people of long experience are very competent even though they may have received no formal training at all. Increasingly, legislation (Regulations) makes mention of the sort of

qualifications that might be sufficient to indicate the competence necessary to undertake particular work responsibilities.

Your answer should also encompass the growing importance of NVQs and similar qualifications.

Q6 Summarise the requirements of The Confined Spaces Regulations.

A6 The three duties defined by The Confined Spaces Regulations are as follows:

- avoid entry into confined spaces
- if entry is unavoidable, a safe system of work must be followed
- adequate emergency procedures must be in place before work starts

Q7 Describe some confined space accidents.

A7 Confined space accidents

- fire / explosion in confined space such as a ship's compartment or an underground water pumping system
- accidents in structures such as grain silos - suffocation in the grain or collapse due to lack of oxygen
- fumes from toxic chemicals in a sewage system
- vapour from solvent or other cleaning agents causing toxic effects or fire in a confined space such as a storage tank
- leakage of volatile chemicals such as a fuel oil into building excavations leading to explosion or toxic effects

Q8 Describe some confined spaces and the hazards which may be associated with them.

A8 Examples of confined spaces and their associated hazards

You should be able to name many examples: drains, ventilation systems, cold compartments for food storage and so on. You should also be able to relate these examples to their respective

hazard(s), which may be classified as follows:

A Hazards presented by gases, fumes and vapours

- substances already present when work begins
 - » remains of stored substances (ie in storage tanks)
 - » sludge and decaying matter (drainage systems, sewers and so on)
 - » carbon dioxide, the product of acid rainwater reacting with chalk
- substances which are created by work activities
 - » welding fumes, adhesives, solvents
 - » heat from human and machine activity
 - » oxygen enrichment from use of oxy/acetylene and similar equipment
- substances which seep into the confined space as the work progresses
 - » as a result of accidental damage to pipelines etc
 - » a consequence of seepage of air currents bringing contaminants into the confined space, for example: exhaust fumes from nearby plant such as dumper trucks and compressors - petrol or diesel plant should never be operated in a confined space

B Oxygen deficiency may occur as a result of organic decay processes using up oxygen or as a

result of an area being purged by the use of an inert gas such as nitrogen to flush out explosive

gases such as methane; further purging with air may be required before the space is safe to enter.

C Fire, explosion and other hazards.

General precautions against the hazards presented by gases, fumes and vapours in confined spaces include:

- use of intrinsically safe electrical equipment
- continuous monitoring of the atmosphere
- provision of adequate ventilation

Q9 Outline the factors which will be encompassed by a permit to work for a confined space

A9 In the case of confined space working, the permit to work provides:

- written authority for the space to be entered and for work to start and finish
- time limits and correct sequences
- procedures and responsibilities of all those involved
- checks and precautions pertaining to:
 - » atmospheric testing
 - » breathing apparatus
 - » rescue equipment and personnel

Q10 Define ‘first aid’.

A10 In defining ‘first aid’, at least you should remember that the 1981 Regulations provide a definition

of ‘first aid’ - the examiners would give you credit for this. If you cannot remember the ‘official’

definition, you should be able to cobble together your own definition encompassing words such as:

... for the purpose of preserving life ... minimising the consequences of injury and illness until the help of a medical practitioner is obtained. The treatment of minor injuries which do not

need further treatment by a medical practitioner.

If you ensure that you include these three aspects in your first-aid definition, you will not go far wrong.

Q11 Define the following:

- appointed person
- qualified first aider
- first aid equipment
- first aid room(s)

A11 For the definition of appointed person etc we refer you to the study material. Also make sure that you have a clear idea of what constitutes, and examples of, low, medium and high risk work environments.

Q12 Which three general principles of prevention are not included in the following list?

- Avoiding risks (wherever possible)
- Evaluating risks that cannot be avoided by carrying out a risk assessment
- Adapting work to the requirements of the individual
- Adapting to technical progress
- Replacing the dangerous by the non-dangerous or less dangerous

- Developing a coherent overall prevention policy.

A12

(1) The three missing principles are:

- Combating the risks at their source, rather than taking measures to control the risk in the wider workplace
- Giving priority to collective protective measures over individual protective measures
- Giving appropriate instructions to workers.

Q13 What type of sign is represented by the following pictograms?

A13

- (i) Mandatory action – must put litter in bins

BLUE



- (ii) Prohibition – not drinking water

RED



- (iii) Safe conditions – drinking water

GREEN



- (iv) Warning – radiation hazard.

YELLOW



Q14 State, in order, the three elements of the hierarchy of control.

A14 First, eliminate the hazard through elimination or substitution.

Second, use engineering controls which reduce the risk at source and provide protection generally rather than individually.

Finally, control the way people interact with the hazard by working patterns and methods, or as a last resort by the use of personal protective equipment.

Q15 What do engineering controls do?

A15 Engineering controls provide plant and equipment with built-in safety features and add particular safety equipment to processes in order to remove or reduce risks.

Q16 When should personal protective equipment be used?

A16 When it has not been possible to eliminate the hazard or reduce risk to acceptable levels by the use of engineering controls, working methods or working patterns.

Q17 Define a safe system of work.

A17 A safe system of work is a formal procedure which results from a systematic examination of the tasks of a work process in order to identify all the hazards and define

methods of working which eliminate those hazards or minimise the risks associated with them.

Q18 How does involving workers in the development of safe systems of work contribute to strengthening the safety culture?

A18 Involvement enables workers to gain a deeper understanding of hazards and risks, and of the way in which safe systems of work will minimise those risks.

Q19 What is the difference between technical, procedural and behavioural controls?

A19 Technical or engineering controls are those which are applied directly to the hazard itself in order to minimise the risk. Procedural controls define the way in which work should be carried out in relation to the hazard. Behavioural controls define how the individual operator or groups of workers must act in relation to the hazard.

Q20 Which types of control listed in (21) are used in permits-to-work?

A20 All of them.

Q21 Why do instruction, training and supervision form a part of safe systems?

A21 Because only people who are competent by means of appropriate training and instruction may be allowed to undertake the work. Supervision is necessary to ensure that staff follow instructions and their training.

Q22 What is a permit-to-work?

A22 Permits-to-work are formal written documents specifying the work to be done and the precautions to be taken. Work can only start when it is confirmed that it is safe to do so, and the work must be carried out strictly according to the requirements of the permit. On completion, confirmation is required that all safety measures have been reinstated before any further work can commence.

Q23 What are the key points in the list of requirements for a permit-to-work form?

A23 The key points in the list of requirements for a permit-to-work form are

- Permit title, number and reference to other relevant permits or isolation certificates
- Job location, plant identification, description of work to be done and its limitations
- Hazard identification and precautions necessary
- Signature of the manager releasing the plant for the job and confirming that isolations have been made/precautions taken, except those which can only be taken during the work
- Signature confirming understanding of the work to be done, the hazards involved and the precautions required
- Hand-back – signatures, with time and date, of both the permit acceptor and issuer confirming that all the procedures have been carried out correctly, the work has been completed and the plant is ready for testing and recommissioning
- Cancellation – signatures, with time and date, certifying that the work has been tested and the plant satisfactorily recommissioned, and that it has been accepted back in a safe condition for production to recommence.
- Protective equipment necessary when undertaking the work
- Date and time duration of the permit
- Extension/shift hand-over procedures – signatures confirming that checks have been made to ensure that the plant remains safe to be worked upon, and that the next workers have been made fully aware of the hazards and precautions. Where an extension to the work is involved, a new expiry time for the permit must be given.

Q24 What is the main objective of an emergency procedure?

A24 The main objective of emergency procedures is to provide a safe environment for workers during an emergency and to limit the loss of property.

Q25 What hazards should be included in a risk assessment relating to emergency procedures?

A25 Hazards at the workplace, and also those at nearby facilities which may affect it.

Q26 What is the role of those with specially designated responsibilities in the event of an emergency?

A26 Their role will be to:

- Receive information about incidents likely to give rise to an emergency situation
- Determine the initial response to the situation, including whether an evacuation is necessary, and lead that response
- Contact the emergency and rescue services as necessary, and brief them on the nature of the incident and any special problems/hazards they might face.

Q27 What items should not be included in a first aid kit?

A29 Medicines and tablets (since they may only be dispensed by qualified medical personnel).

Element 7 Monitoring, review and audit

Q1 List some of the indicators that could be used to measure the effectiveness of the safety policy.

A1 Yes we started this question as if it were an element 2 (Policy) question, but really the answer required is a IGC1/5, 7, 8 answer. When you first work through the study material, it will perhaps appear in your mind as sixteen fairly separate chunks. We have tried to emphasise the spider's web of links across the syllabus and by the time you have finished the study material a second time around, you should be becoming alert to 'across-the-element' questions such as this. The syllabus lists the following forms of safety monitoring:

- surveys
- inspections
- tours
- sampling

(For completion, you should also have made passing reference to reactive monitoring: accidents, complaints from workers etc - the safety policy must have within it facilities for addressing things that have gone wrong. Also a mention of auditing would enrich your answer.)

As we have stressed, it may not be clear as to exactly when a survey becomes an inspection, but if you have in your mind a range of examples which you can use in your examination, you will be able to demonstrate your understanding to the NEBOSH examiners

- safety inspection ... a physical inspection of part(s) of the workplace or of aspects of the work,

probably making use of checklists

- safety tour ... a management team examines certain aspects of an organisation, perhaps as a prelude to more detailed investigations.

- safety sampling ... an inspection which is limited to certain areas of the workplace or to certain

aspects of workplace activity.

- survey ... for example, a noise survey of an engineering workshop; survey may also mean planning the campaign to make best use of limited resources

(We have tended to talk of safety sampling, safety survey; there will of course also be health sampling and health surveys - the noise survey would of course fall into this category.)

Q2 Just checking (again) ... you are able to **outline** the structure of HSG65 aren't you?

A2 The structure of HSG65. We realise we are running the risk of overdoing the need for you to know the structure of HSG65, but if you do ... well done. If you don't, check back in the IGC1/7 study material (or the IGC1/2, 3 or 4 study material for that matter.)

Q3 Explain why accident and illness records may give a very limited indication of the effectiveness of the health and safety policy.

A3 Accident records. As we have stressed, and as the law requires, companies must keep records of accidents and illness. Such data may give a very poor indication of the effectiveness of the health and safety policy, particularly in a small company - in one word 'statistics'. The accident in which a worker is crushed to death by a reversing lorry in a sand and ballast yard where 'nothing like this has ever happened': in the course of a few seconds, the accident statistics for the yard have dramatically changed. Proactive monitoring would have highlighted the fact that there is no system of work in place for dealing with the manoeuvring of vehicles in the yard. Similarly, illness records are days ... months ... years removed from their cause. Again, appropriate proactive monitoring is required of the agents in the workplace: levels of chemicals in the air, the noise climate, vibration levels, intensity of radiation such as X-rays, infra-red and so on.

Q4 Write a few words about statutory inspections.

A4 Statutory inspections, ie legal requirements for testing certain pieces of equipment: Statutory testing, which will probably be undertaken by an outside organisation (insurance company or the manufacturer) is also required for pressure vessels, steam boilers used in central heating systems and other such equipment.

Even though statutory testing may be undertaken by an outside organisation, it remains the responsibility of the management to ensure that the testing is undertaken as required.

Q5 Outline the distinction between a safety survey, a safety tour and safety sampling.

A5 In outlining the distinction between a safety survey, a safety tour and safety sampling we suggest that you should make use of examples.

• survey: detailed investigation of one aspect of the workplace:

- » noise / use of hearing protection
- » pedestrian and vehicle management
- » machine guards
- » fire precautions / equipment

• survey (alternative and rather different use of the word): familiarisation exercise, preliminary checks before detailed survey (used in the above sense) is undertaken

• safety tour: usually something of a 'doctors round' with a group of people of different skills and positions in the company; we are aware that 'doctors round' may conjure up in your mind two very different pictures: a team pulling together, making full use of their skills or a group of people being towed around by (s)he-who-must-be-obeyed; whatever, in our experience

the word 'tour' does usually appear to involve a group of people

- safety sampling: in our mind, sampling probably falls below the survey in the hierarchy but is a good way for the safety officer, line manager etc to keep in contact with the activities in and needs of the workplace - perhaps acting as a trigger for certain more detailed surveys; sampling
- is obviously also of value in maintaining the profile of the ‘safety people’ in the organisation (As an aside, it is probably unlikely that NEBOSH would ask you this survey / tour / sampling question because they are well aware that there are problems of terminology; however, as we have already emphasised, NEBOSH will expect you to explain why ...

Q6 Why would even the most thorough inspection of the whole workplace not constitute an audit?

A6 ... even the most thorough inspection of the workplace will not constitute an audit. This because an audit, by definition must encompass an investigation of an organisation’s safety management system (to repeat a phrase we like: ‘is the company doing HSG65?’). An inspection does not ask this question, it looks at detail; the audit reviews the broader picture.

Q7 Create a **definition** of a health and safety audit.

A7 Any definition of a health and safety audit should include the words:
... structured process ... independent information ... effectiveness ... health and safety management system ...
No prizes for seeing that all we have done is remove some words from the HSG65 definition which uses all the important words.

Q8 Outline the circumstances in which persons outside the company might be involved in undertaking aspects of a safety audit.

A8 Persons outside the company might be involved in undertaking aspects of a safety audit in some of the following circumstances:

- engineering surveyors (including manufacturers of the equipment used)
- insurance company personnel:
 - » statutory inspections (pressure systems such as boilers, lifting equipment, fire certificate checks)
 - » general inspections in connection with the employer’s liability insurance
 - » investigating claims connected with accidents (this of course will not be a planned in advance part of the audit but if accidents, ill-health, dangerous occurrences have happened, they must be encompassed by the audit)
 - » liaising with risk management and technical consultants carrying out inspections
- outside consultants undertaking safety inspections, noise surveys, environmental surveys
- HSE and local authority inspectors undertaking statutory inspections or carrying out accident investigations

Q9 Define reactive and active monitoring.

A9 Reactive monitoring is where accidents and other safety-related incidents are investigated to find out what went wrong and identify action to put it right so that there will be no recurrence. Active monitoring is where the existing safety measures are inspected to find out if anything may go wrong and identify action to put it right before there is an incident.

Q10 What are performance standards and what role do they play in monitoring?

A10 Performance standards are the statements of who does what, when and with what result in the organisational arrangements and control measures designed to ensure health and safety at work. They form the basis against which actual performance may be measured to identify how effective the safety policy is in practice.

Q11 What do we mean by systematic monitoring?

A11 Systematic monitoring involves the taking of planned regular action to seek information about the effectiveness of the organisation and arrangements regarding health and safety.

Q12 State the sources of information used in reactive monitoring.

A12 The information for reactive monitoring comes from the investigation of accidents and other safety-related incidents, issues raised by workers and failings identified by external agencies (usually enforcement authorities).

Q13 State the purpose of workplace inspections.

A13 The purpose of workplace inspections is to ensure that the control arrangements specified in the safety policy are operating effectively and that they cover all the risks.

Q14 What three key elements do all forms of workplace inspection include?

A14 The three common elements of all inspections are:

- An assessment of the standards of workplace health and safety against the specified performance standards and the risks
- The identification and reporting of any deficiencies
- The identification of causes and of action to be taken to remedy the problem.

Q15 What inspections involve operators?

A15 Routine inspections of the immediate work area and plant, machinery and equipment used.

Q16 What is the difference between a safety survey and safety tour?

A16 Safety tours are generally unannounced inspections of the major control measures in a workplace following a predetermined route. Safety surveys are in-depth inspections of specific issues or procedures where there is reason to believe that there may be deficiencies in the existing safety systems, either because of changes in the workplace or on the basis of problems identified by other monitoring techniques.

Q17 What role does senior management have in workplace inspections?

A17 Senior management has responsibility for ensuring that effective workplace inspection regimes are in place and are operated effectively. This will include receiving reports and overseeing/agreeing action. In addition, the visible involvement of senior managers in all types of inspection is to be encouraged for the commitment it demonstrates towards safety and the effect on the promotion of a positive health and safety culture.

Q18 Why are checklists used in inspections?

A18 Checklists help to ensure a consistent systematic and comprehensive approach to checking all the safety elements to be covered during an inspection.

Q19 Identify the seven Cs which underpin effective report writing.

A19 The seven Cs are be:

- Clear
- Concise
- Correct
- Courteous
- Complete
- Consistent
- Convincing

Q20 What should the introductory part of a report contain?

A20 The introductory part of a report should set the scene, covering the background to the issue, why it is being dealt with and briefly, what is to come. The following elements should be covered:

- Preface stating the title, who the report is to and who has written it, the date, general authority for its writing, and reference.
- List of contents.
- Brief summary of the aims, main findings and recommendations.
- Statement of purpose and objectives, including the organisational context of the inspection, problems or issues addressed, approach and any legal aspects which apply.

Q21 What is the “sample” taken in safety sampling?

A21 The sample is the snapshot of the state of health and safety at one particular time throughout the premises.

Q22 Performance review is concerned with ensuring that incident investigations are properly concluded. True or false?

A22 True, but it is concerned with more than just reactive monitoring. It encompasses all forms of systems for monitoring, checking and measuring the effectiveness of health and safety arrangements and, where there are deficiencies, for reporting and taking action at the appropriate level to remedy them.

Q23 State five factors which influence the frequency of monitoring activities.

A23) The main factors influencing the frequency of monitoring activities are:

- Suitable intervals to ensure that specific planned milestones are achieved
- The potential for change in conditions over time
- The relative importance of the activity or particular precaution relative to the overall control of risk
- Where inspection and maintenance intervals are prescribed by suppliers/manufacturers
- Where intervals for monitoring are prescribed by legislation
- Where there is evidence that there is non-compliance
- Where there is evidence of compliance.

Q24 Define health and safety auditing.

A24 Health and safety auditing is the structured process of collecting independent information on the efficiency, effectiveness and reliability of the total health and safety management system and drawing up plans for corrective action.

Q25 What is a compliance rating and what does a compliance rating of 54% indicate?

A25 A compliance rating indicates the degree to which the organisation is meeting a particular performance standard. A rating of 54% would indicate that compliance is at the minimum acceptable level, probably sufficient only to meet legal requirements.

Element 8 Incident investigation, recording and reporting

Q1 Root cause, immediate cause ... by way of examples, **explain** the meaning of these terms.

A1 Root cause: these are system failures - the seed bed that allows the immediate causes to germinate and eventually lead to an accident or an incident; root causes might involve:

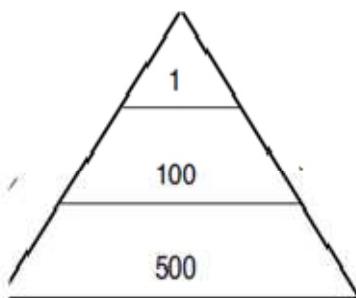
- (in)adequacy of training, both in general and for specific equipment maintenance
- systems of work that fail to achieve the required objectives
- failure to conduct appropriate risk assessments and inspections
- personnel and personal matters ... wrong staff, unrealistic demands, harassment

Immediate causes might involve what we have described as substandard acts or conditions which directly cause the accident:

- substandard acts:
 - » removal of, or damage to, a guard
 - » poor housekeeping such spillages or rubbish leading to fire, slipping etc
- substandard conditions:
 - » operator error,
 - » failure in use of, or failure to use, ppe
 - » human factors such as lack of concentration, fatigue

Q2 Describe the basic idea of the accident triangle in one sentence; draw a figure by way of illustration.

A2 Accident triangle:



we gave Heinrich's 1931 definition in the study material, namely '... for every mishap resulting in an injury, there are many accidents that cause no injuries at all'.

We have to be careful when talking about 'accidents' and 'incidents' and 'mishaps' and 'near misses' - these words are not always used in the same way. Heinrich's 'many accidents that cause no injuries at all' might, or might not, qualify as a RIDDOR 'reportable dangerous occurrence'. There are various versions of the accident pyramid/tip of the iceberg models; something like this would be fine for the purposes of the NEBOSH Certificate:

In the study material we emphasised the examiners' frequent comment that: "when answering 'accident causes' questions, few students support their answers with basic accident causation theory". The examiners are not asking you to discuss in detail the merits of the single- and multicausal models, they just want you to make a mention of one or other of them as you describe the factors leading on to a particular accident. Remember this as you tackle this type of question.

Q3 Single-causal (domino) accident model: briefly **describe** the single-causal accident model (Bird and Loftus) for the following five 'dominos'; give examples for each domino.

- lack of management control
- basic causes (personal and job factors)
- immediate causes
- accident
- loss

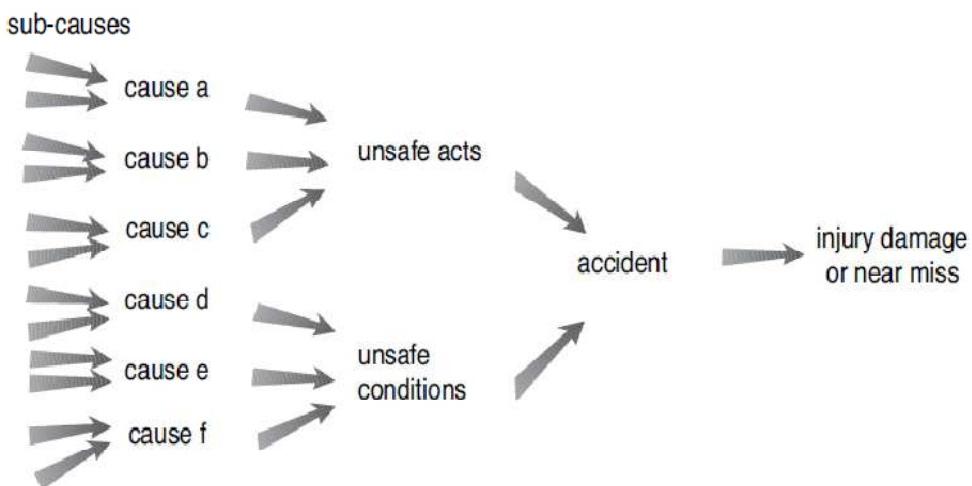
A3 Single-causal accident model

When you are giving examples of the different dominos: lack of management control domino /

basic cause domino / etc, do make it clear to the examiners whether or not you are describing one particular domino sequence or if you are choosing individual domino examples from more than one domino sequence. In the study material we gave plenty of examples of lack of management control etc;

Q4 (You have already seen this question in the study material.) Choose a few accidents of your own experience and see if you can present them in accident tree form.

A4 Tree form - another way of saying multi-causal. Your answer(s) should be built around the type of figure you saw in the study material, making as clear a distinction as possible between an unsafe act and an unsafe condition (not always easy) ...



Q5 Suggest some ways in which accidents may be classified; why might this process be of value to an organisation?

A5 Classification of accidents

There is no one way to classify accidents - think of the different organisations who will be using

accident information: unions, pressure groups involved with young people at work, employers

federations, HSE, a company on one site with a very limited range of activities, a company with

many sites and very wide range of activities, and so on. You might have mentioned:

- classifications as used by (inter)national organisations such as the ILO
- the physical or material cause
- ‘victim centred’, ie the age, sex etc of the victim
- the part of the body injured

Q6 Distinguish between proactive monitoring (active monitoring) and reactive monitoring.

A6 Proactive monitoring: the techniques were introduced in NGC1/2 and form the principal concern of IGC1/7: audits, inspections, sampling, surveys and involve an assessment of the ‘health’ of an organisation so that actions may be taken before accidents happen.

Reactive monitoring: information relating to failures in health and safety (ie accidents and near misses) should be collected and analysed - the organisation reacting to, and learning from, its mistakes; related activities include record keeping, remedial actions, follow ups.

The information gained from both the proactive and reactive monitoring can highlight areas on which management should prioritise their activities.

Q7 You will remember that in IGC1/6 (in the section entitled ‘Balancing collective and individual protective measures’) we dealt with this part of the syllabus for IGC1/6:

- giving priority to collective protective measures (eg engineering control) over individual protective measures (eg personal protection); concepts of ‘safe place’ and ‘safe person’.

By way of revision of the key points ... distinguish between safe place and safe person strategies.

A7 A satisfactory safe place / safe person answer could encompass brief comments under the following headings:

safe place

- safe workplace
- equipment
- environment

safe person

- ppe
- information, instruction, training
- safe behaviour

Equally important is the fact that your answer should also make mention of the need to strike the appropriate balance in the safe place ↔ safe person equation - a balance which will change be different for normal work, maintenance operations and emergency situations.

Q8 (Revision of earlier units.) Several HSE publications recommend a five step approach in the development of a safe system of work; what are these five steps?

A8 HSE’s five steps to a safe system of work:

Step 1 Assess the task

Step 2 Identify the hazards

Step 3 Define safe methods

Step 4 Implement the system

Step 5 Monitor the system

Q9 (More revision.) Briefly expand on each of the five steps of the previous question.

A9 Our study material gave a fuller description of the five steps; here are some key points:

Step 1 Assess the task

- what is used
- who does what
- how the tasks are carried out
- why the tasks are done this way
- where and when the various tasks are carried out

Step 2 Identify the hazards: remember, if the hazards can be eliminated altogether there is no need for the safe system of work.

Step 3 Define safe methods

Oral, written, formal permit to work schemes

- preparation and authorisation needed at the start of the job
- clear planning of job sequences
- specify safe work methods
- means of access and escape
- dismantling, disposal etc at the end of the job

Involve those who will be doing the work.

Special requirements of permit to work schemes

Step 4 Implement the system; communicated to, and understood by, employees, including:

- role of supervisors
- training employees to have the confidence and understanding to know when to stop work when faced with an unexpected problem.

Step 5 Monitor the system

- is the system workable?
- are the procedures in the system of work being carried out?
- are they effective?
- are there any significant changes in circumstances which require alterations to the system of work?

Job safety analysis can be activity based or job based:

- activity based, for example:
 - » all work carried out above 2 metres
 - » all driving activities - internal (fork lift trucks, etc) and external, ie on the public highway
 - » loading and unloading of kilns in a pottery
- job based
 - » the activities of the maintenance engineer (some of whose work will probably need to be undertaken at height)
 - » pottery worker(s) who prepare and apply the glazes, load and unload the kiln, replace damaged brickwork in the kiln, and so on

Q10 An accident occurs, **outline** some of the procedures that should be in place in the organisation.

A10 Procedures following an accident: quite deliberately, this question was not worded very precisely because we wanted to put in your mind the realisation that there are several different aspects to the question:

- procedures for informing next-of-kin
- management of accident data
 - » method(s) and personnel involved in data collection
 - » data collection format for different departments (are these consistent?)
 - » combining and comparing the data from different departments
 - » feeding back the digested / processed data into the organisation's health and safety system so that it is appropriately acted upon

Q11 Very briefly **outline** the ways in which accident data might be analysed.

A11 Analysis of accident and illness data should be undertaken to look for patterns and events of significance:

- the comparative performance of departments
- the relationship between accidents and work patterns: shift changeover, maintenance, new workers, introduction of new equipment, the production cycle and so on

Q12 Outline the main features of an accident investigation sequence.

A12 Accident investigation sequence: remember that if you need help in developing your general sequence you should think through the sequence of events in a few real accidents:

- accident is reported to:
 - » safety advisor
 - » personnel department
 - » ‘safety’ manager
 - » senior management (if the accident is serious)
 - » appropriate authority (HSE etc)
- whoever is charged with the responsibility for investigating the accident will undertake to ...
 - » visit the site and record details (camera etc)
 - » conduct interviews
 - » draft the report
- discussion and modification of draft report to produce final report
- report submitted to safety committee, senior managers, safety representatives
- implement the recommendations of the report
- monitor effectiveness of remedial actions
- provide feedback

Q13 What is the prime purpose of an accident investigation?

A13 The main purpose of an accident investigation is to find the cause, with the intention of preventing a recurrence.

Q14 What are the four elements of the investigation process?

A14 Establishing the facts, identifying immediate causes, identifying any underlying causes and identifying remedial action to prevent the causes from occurring again.

Q15 Identify the categories of staff who may be considered useful members of an internal accident investigation team.

A15 The categories of staff might include the immediate supervisor or foreman, a member of management, a safety representative and a safety officer.

Q16 List the types of documentation which may need to be consulted during an accident investigation.

A16 The types of record to be consulted are:

- Inspection and maintenance records
- Risk assessments
- Environmental measurements
- Medical records
- General and specific safety reports and analyses which relate to the circumstances
- Training and other personnel records
- Minutes of safety committee meetings.

Q17 What are the two categories of immediate cause of accidents/incidents?

A17 Unsafe acts and unsafe conditions.

Q18 Who is responsible initially for the reporting of accidents and safety-related incidents?

A18 The first-line manager or supervisor.

Q19 What is the purpose of analysing all information about accidents?

A19 To identify underlying causes of accidents and to provide information about trends and other patterns in workplace accidents

Q20 To whom do the results of accident investigations have to be communicated?

A20 The result of an individual accident investigation would be communicated to the victim, his/her immediate manager and the local safety representative in all instances. Depending on the seriousness of the accident and the extent of the underlying causes, it may also be necessary to inform other managers in the organisation, including senior management, and the safety committee. For reportable incidents, the results must also be notified to the enforcement agency.

Q21 Apart from the accident documentation about the particular incident, what other information may be relevant to a claim for damages in respect of injuries suffered as a result of a chuck guard malfunctioning on a bench press or drilling machine?

A21 The types of information may include:

- Accident documentation about any other similar incidents
- Risk assessments relating to drilling work in that particular workplace
- Inspection and maintenance records relating to the particular guard and to others in the area
- Other recent and relevant documentation relating to the use of guards, reporting of faults, worker history (including training records), etc.

IGC2: Control of International Workplace Hazards

Past Questions & Answers from NEBOSH IGC Examinations

Q1 Identify the factors that could place a greater risk of accidents at work on young persons.

[4]

A1 Lack of knowledge, lack of experience, lack of training, physical development of the individual, desire/nature of young person to take risks, peer group pressure in young persons is generally greater than that of more experienced individuals.

Q2 Outline possible measures to minimise the risks to young persons at work. [4]

A2 Carry out a young person's risk assessment, comprehensive induction training, good supervision by experienced and responsible employees, specific health surveillance, clear lines of communication, restriction on the variety of work , shift patterns and number of hours worked.

Q3 Identify eight common causes of fires in the workplace. [8]

A4 Faulty electrical equipment or incorrectly used electrical equipment, smoking materials discarded unsafely, poorly maintained equipment ie friction caused by lack of lubrication, sparks from certain types of work eg grinding, hot surfaces on heating appliances, wilful intention to cause fires [arson], static electricity resulting from improper transfer of flammable liquids, certain chemical reactions can give off heat, hot work eg cutting & welding.

Note: Please remember to pay attention to the wording of the question ie " causes of fires" is different from the spread of fires!, also I would urge you to practice answering questions in paragraph style unless you were asked to list in which case you can list or use bullet point answers.

Q5 Outline the possible effects on health from exposure to high levels of noise (8).

A5 Possible effects on health from exposure to high levels of noise include:-
both permanent and chronic effects

noise induced hearing loss (caused by damage to the hair cells of the inner ear with reduced hearing capacity at particular frequencies)

tinnitus and temporary effects such as temporary threshold shift, acute tinnitus, stress and fatigue.

acute trauma such as a burst eardrum caused by exposure to sudden loud noise

Q6 Outline the hazards that a worker could be exposed to when using a petrol driven chainsaw to cut down tree (8)

A6 Hazards from a petrol driven chainsaw include:-

contact with moving parts of the chainsaw

exposure to fumes and dust

hazards arising from manual handling operations

exposure to noise and vibration

falls from height

handling lubricating oils which might lead to dermatitis

flying particles such as tree bark and sawdust

uneven ground or wet grass which could lead to slips and falls

falling objects such as branches or the tree itself

contact with overhead services

hazards from adverse weather conditions

Q7 Identify EIGHT common causes of fires in the workplace (8)

A7 Common causes of fire in the workplace include:-

faulty or incorrectly used electrical equipment

machinery or plant which has either incorrectly used or badly maintained such as friction caused by inadequate lubrication

chemical reactions that may give off heat

hot work such as welding or cutting

smoking materials which are discarded in an unsafe manner

hot surfaces such as those on cooking or heating appliances

sparks from cold working such as grinding

static electricity arising from the incorrect transfer of flammable liquids

arson

Q8 Outline the precautions that should be taken when using mobile cranes (8)

A8 Precautions for the use of mobile cranes could include:-

ensuring the crane and its attached lifting gear are suitable for the task

that the ground on which the crane is to be sited is flat and firm and that the outriggers of the crane are always correctly positioned

that the driver and slinger to be used in the operation are competent

that there are no obstructions such as overhead power lines or buildings in the vicinity of the lift and that warning signs and barriers are erected to ensure that the area where the lift is to take place is kept clear of personnel not directly involved in the lift
the actual lift should involve carrying the load smoothly at an appropriate height and ideally to an arranged lifting plan.

Q9 Outline the control measures that might be required in order to minimise risks to workers. (8)

A9 The control measures that might be required in order to minimise risks to workers include:-

use of suitable containers for the chemicals carrying warning signs as to their danger
the methods used for handling the chemicals
procedures for the cleaning up and containment of the spillages
the provision of adequate ventilation for the working areas and the use of personal protective equipment such as chemical proof gloves, eye protection and overalls
site rules setting out the hygiene procedures to be followed and prohibiting eating or smoking in the working areas
setting up emergency procedures including first aid provision
providing employees with instruction, information and training on the handling of toxic substances and ensuring the provision of adequate supervision and monitoring to check that control measures were being followed.

Q10 Excavation work is being carried out on a construction site. **Identify** the control measures needed to reduce the risk to workers (8)

A10 The control measures needed to reduce the risk to workers include:-
the detection of underground services by using plans or cable/pipe detectors
supporting the sides of the excavation by shoring or benching
storing materials and spoil away from edge of the excavation
providing means to prevent vehicles falling into the excavation such as stop blocks
providing guard-rails and barriers to prevent people falling into the excavation
providing means of support for adjacent structures to prevent collapse
providing safe means of access/egress into the excavation
testing for noxious fumes and providing ventilation if necessary
using pumps to protect against flooding
taking precautions to safeguard the workers from biological hazards or those caused by the presence of contaminated ground
arranging for the excavation to be inspected at regular intervals by a competent person

Q11 A glassworks produces covers for streetlights and industrial lighting. The process involves molten glass being blown by hand and shaped in moulds.

- (i) **Identify** FOUR health effects that may be caused by working in the hot conditions of the glass factory. (4)
- (ii) **Describe** measures that could be taken in order to minimize the health effects of working in such hot environments. (6)
- (iii) **Outline** the factors relating to the task and the load that may affect the risk of injury to an employee engaged in stacking the finished product onto racking. (10)

A11:

- (i) 1. Heat exhaustion due to high ambient temperature
2. Dehydration due to excessive sweating

3. Heart stress and, in extreme cases, heat stroke due to prolonged exposure to high ambient temperatures

4. Burns from handling hot molten glass

5. (Additional answer) the eyes can also be affected by high intensity light from looking at molten glass.

(ii) The health effects of working in a hot environment can be reduced by the gradual acclimatization of new workers. Even after the initial acclimatization, frequent rest periods will be necessary to allow the body to acclimatize to the hot conditions on a daily basis. Rest should be in cool areas which in summer may need to be artificially cooled. If, in addition, the humidity is high, a good supply of ventilation air will be needed, to help control sweating. Adequate supply of cold drinking water is essential to avoid dehydration.

Workers in hot conditions should wear appropriate clothes, which must be a compromise between lighter garments to promote evaporation of perspiration, and protective clothes to prevent burns. It will be necessary to provide protective leather or fire resistant aprons and gloves, and appropriate eye and face protection such as eye visors. Visors may need to be supplied with cooling air to keep people cool and permit proper vision. Screens could also be provided to protect workers from radiant heat.

Periodic health surveillance should be provided. Finally, workers should be trained to recognise ill health affects on others.

(iii) The task should be analysed in detail so that all aspects of manual handling are covered including the use of mechanical assistance. This will involve a manual handling risk assessment. The number of people involved and personal factors, such as age and health, should also be considered. A satisfactory body posture must be adopted with the feet firmly on the ground and slightly apart. To avoid work related upper limb disorders (WRULDS) there should be no stooping or twisting of the trunk; it should not be necessary to reach upwards since this will place additional stresses on the arms, back and shoulders. The further the load is held or manipulated from the trunk, the more difficult it is to control and the greater the stress imposed on the back. These risk factors are significantly increased if several of them are present at the same time. The load should not be carried over excessive distances (greater than 10 m). The frequency of lifting, and the vertical and horizontal distances the load needs to be carried (particularly if it has to be lifted from the ground and/or placed on a high shelf) can lead to fatigue and a greater risk of injury. If the loads are handled whilst the individual is seated, the legs are not used during lifting and stress is placed on the arms and back.

There should not be excessive pulling, pushing or sudden movements of the load. The state of floor surfaces and the footwear of the individual should ensure that slips and trips are avoided.

There should be sufficient rest or recovery periods and/or the changing of tasks particularly in the hot ambient temperatures of the glassworks. This enables the body to recover more easily from strenuous activity.

The imposition of a high rate of work is a particular problem with some automated production lines and can be addressed by spells on other work away from the line.

The handling capability of an individual is approximately halved when he or she becomes a member of a team. Visibility, obstructions and the roughness of the ground must all be considered when team handling takes place.

The load must also be carefully considered during the assessment – it may be too heavy. The maximum load that an individual can lift will depend on the capability of the individual and the position of the load relative to the body. There is therefore no safe load but guidance is available from HSE literature, which does give some advice on loading levels. If the load is too bulky or unwieldy, its handling is likely to pose a risk of injury. Visibility around the load

is important, as is awareness that it may hit obstructions or become unstable in windy conditions. The position of the centre of gravity is important for stable lifting – it should be as close to the body as possible; however, this may be difficult if the load is hot, such as in boxes or trays of recently blown glass. They should be allowed to cool sufficiently.

The load becomes difficult to grasp when it is carried over slippery surfaces, has rounded corners or there is a lack of foot room. Sometimes the contents of the load are likely to shift. This is a particular problem when the load is a container full of smaller items, such as small glass covers. These are glass components which may shatter if dropped and leave shards of glass to be carefully cleared up.

The load is likely to be hot and could be sharp as well in places or when broken so that personal protective equipment, such as leather gloves and aprons plus eye protection, may be required.

Q12 Outline the precautions that may be needed when carrying out repairs to the flat roof of a building. (8)

A12: Roof work is hazardous and requires a specific risk assessment and method statement prior to the commencement of work so that the required precautions may be identified. The particular hazards are fragile roofing materials, including those materials which deteriorate and become more brittle with age and exposure to sunlight, exposed edges, unsafe access equipment and falls. There must be suitable means of access such as scaffolding, ladders and crawling boards. Suitable edge protection will be needed in the form of guard rails to prevent the fall of people or materials, and access must be restricted to the area below the work using visible

barriers. Warning signs indicating that the roof is fragile, should be displayed at ground level. Protection should be provided in the form of covers where people work near to fragile materials and roof lights. The means of transporting materials to and from the roof may require netting under the roof and even weather protection.

Precautions will be required for other hazards associated with roof work, such as overhead services and obstructions, the use of equipment such as gas cylinders and bitumen boilers and manual handling.

Finally, only trained and competent persons must be allowed to work on roofs and they must wear footwear having a good grip. It is good practice to ensure that a person does not work alone on a roof.

Q13 For EACH of the following agents, outline the principal health effects AND identify a typical workplace situation in which a person might be exposed:

- (i) carbon monoxide (2)
- (ii) asbestos (2)
- (iii) legionella bacteria (2)
- (iv) hepatitis virus. (2)

A13:

(i) Carbon monoxide is a colourless, tasteless and odourless gas. It causes headaches and breathlessness and at higher concentrations unconsciousness and death. The most common occurrence of carbon monoxide is in exhaust gas from a vehicle engine. Working in a vehicle repair garage without proper ventilation to exhaust gases would expose a person to carbon monoxide fumes.

(ii) Asbestos produces fine fibres which can become lodged in the lungs. This can lead to asbestosis (scaring of the lungs), lung cancer or mesothelioma – cancer of the lining of the lung. Asbestos can be found in buildings, in ceiling tiles and as lagging around heating pipes.

When these sites are disturbed, the asbestos fibres become airborne and inhalable affecting those engaged in maintenance or demolition work.

(iii) Legionella is an airborne bacterium and is found in a variety of warm water sources between 20 and 45°C. It produces a form of pneumonia caused by the bacteria penetrating the alveoli in the lungs.

The disease is known as Legionnaires' disease and has symptoms similar to influenza. The three most common systems at risk from the bacteria are water systems that incorporate a cooling tower, air conditioning units, and showers. People working on these systems or working in the area of infected systems are at risk, particularly if they are over 45 years of age and it affects men more than women.

(iv) Hepatitis is a disease of the liver and can cause high temperatures, nausea, jaundice and liver failure. The virus can be transmitted from infected faeces (Hepatitis A) or by infected blood (Hepatitis B and C). Hospital workers and first aiders who come into contact with blood products are at risk of hepatitis.

Practice Questions & Answers from NEBOSH IGC Examinations

Q1 Excessive dust levels have been discovered in a workplace, the principal cause being the inefficient local exhaust ventilation system (LEV). **Identify FOUR** indications that could have highlighted the LEV systems' inefficiency. (4)

A1 Deposits of dust on surfaces and people

Visible particles in the air

Discomfort and irritation by employees

Air monitoring reviews

Actual ill-health in employees due to exposure to dusts

Q2 Outline the factors which could have reduced the LEV systems effectiveness. (8)

A2 Poor design

Lack of planned testing

Lack of maintenance

Extraction hood too far from dust source

Damaged or blocked ducting or filters

System alterations – unauthorized

Settings incorrect

Faulty fan

Process changes that could lead to greater dust emissions.

Q3 Describe other methods of control to minimise levels of airborne dust except from LEV. (8)

A3 Hierarchy of control

Eliminating the process causing the dust

A change in process to reduce dust amounts

Substitution of materials i.e. capsule form, pellets or liquid

Segregation or enclosure of the dust creation process

Damping down the dust for easier removal such as vacuuming

Methods of cleaning so as not to disturb the dust i.e. vacuuming instead of sweeping

Q4 Outline necessary precautions to be taken when pedestrians are required to work close to vehicle movement areas. (8)

- A4 Segregation systems for vehicles and pedestrians
- Clear and appropriate road markings
- Visibility – mirrors, transparent doors, adequate lighting etc.
- Vehicular audible warnings
- Site rules
- High-visibility clothing
- Good housekeeping
- Training and supervision of all involved on site

Q5 Factory cleaning staff use a rotary floor polisher each night. **Identify** the associated hazards. (4)

- A5 Entanglement
- Slips, trips and falls
- Noise
- Vibration
- Electrical hazards
- Ergonomic hazards
- Possible chemical involvement of cleaning agents

Q6 Outline what control measures could be used to reduce the risks. (4)

- A6 Guarding
- Cable management
- Isolation for the task of changing brushes
- Appropriate non-slip footwear
- Regular testing and maintenance
- Residual current devices – RCD's
- Training to ensure pre-use checks

Q7 Outline precautions needed when maintenance work is being carried out in an underground storage vessel. (8)

- A7 Permit-to-work
- Risk assessment
- Isolation
- Pre-cleaning
- Purging and testing the vessel's atmosphere
- Safe means of access and egress
- Appropriate tools i.e. non-spark
- P.P.E
- Appropriate lighting
- Continual monitoring
- Competent and trained personnel
- Good communication systems between tank and above-ground workers
- Maintenance of detailed emergency procedures

Q8 Outline the principal requirements to ensure excavation work is carried out safely. (8)

- A8 Examine the support structures weekly by competent person
- Record examination
- Inspect working part daily or per shift if deeper than 2m

Inspect support material before use
Support work done under supervision of competent person
No person to work in excavation unless competently examined
No projecting nails on support structure
No materials left near edges of excavation

Q9 With respect to work-related upper limb disorders (WRULD's). **Identify** typical symptoms. (4)

A9 Back, neck and shoulder pain
Swollen joints
Reduced mobility and stiffness
Cramps and muscle fatigue/tiredness

Q10 Outline the factors that would increase the development of WRULD's. (4)

A10 Display screen equipment issues – DSE
Layout of workstation
Insufficient breaks from the task
Inadequate space leading to poor postures
Excessive force needed to carry out tasks
Frequency of the task
Vibrating tools/equipment
Pre-existing medical conditions
Pregnant women

Q11 Outline what is required for a safe means of escape when evacuating a building in the event of fire. (8)

A11 At least two escape routes in opposite directions, none to exceed the recognised travel distance
Escape route fire integrity
Self closing fire doors that open outwards easily
Escape routes clearly marked
Emergency lighting for routes
Routes kept free from obstruction
Safe, clearly signed assembly point

Q12 What are the principal hazards associated with the use of ladders at work? (3)

A12 Poor maintenance
Incorrect use
Incorrect locations

Q13 Explain how these hazards may be eliminated or reduced. (5)

A13 Inspection and repair
Correct storage
75 degrees slope (1 in 4)
Secured top and base
Not to use aluminium ladders near overhead cables

Q14 Outline the precautions to protect against electrocution when excavating near underground cables (4)

A14 Supply isolation
Cable routes identification via plans and cable detectors

Checking for service box covers
Marking of cable routes
Digging with hand-tools

Q15 Outline the precautions to protect against electrocution when working near overhead power lines (4)

A15 Isolation

Goal-post barriers defining clearance distances
Use of signs and bunting to clearly mark danger zones
Safe access routes under lines
Use of marshals and banksmen when cranes, excavators or tipper lorries may approach
Restriction on use of metal ladders and scaffold tubes

Q16 List EIGHT routine inspection items included on a checklist at the beginning of a shift, before using a fork-lift truck. (8)

A16 Tyre pressure and condition
Lights functioning (where fitted)
Secure and properly adjusted seats
Undamaged mirrors with good vision
Leakages from various fluids – diesel, battery acid, oil, brake fluid etc.
Battery connections
Chains in good order
Horn operates
Reversing audible signals where fitted
Forks in good order
Break checks, including hand break
Forks do not drop when raised – hydraulic fluid levels ok
No play in steering wheel

Q17 Outline EIGHT precautions that should be considered to prevent injuries to children who may be tempted to access a construction site. (8)

A17 Fencing
Warning signs of any dangers
Security patrols
CCTV
Isolating services
Reducing heights of materials
Covering excavations
Removing ladders – lashing the ladders – to deny access to scaffolding
Securing tools, chemicals, equipment and vehicles under lock and key
Community liaisons

Q18 Define ‘ergonomics’. (2)

A18 The study of the interaction between workers and their work, and is concerned with the design of the workplace, work equipment and work methods with the needs and limitations of the human operator in mind.

Q19 Outline which health issues could be caused by poor ergonomic designs of display screen equipment (DSE) workstations. (4)

A19 Work-related upper limb disorders such as: pain in shoulders, arms (including forearms), wrists, hands, fingers and even neck pains.

Eye strain

This question asks for an outline which would typically include detail of the symptoms and the circumstances that would make the effects more likely.

Q20 Outline which factors should be considered for an ergonomic assessment of a DSE workstation. (14)

A20 Equipment

Environment

Task

Individual - inter-relationships between these four

Repetition

Working posture of fingers, hands and wrists

Working posture of shoulders and arms

Psychosocial factors such as: pace of work, unplanned overtime/shift work, little control over own work, stressful deadlines, lack of training

Q21 Use **sketches** to clearly show what is meant by the following terms relating to mechanical hazards from moving parts of machinery.

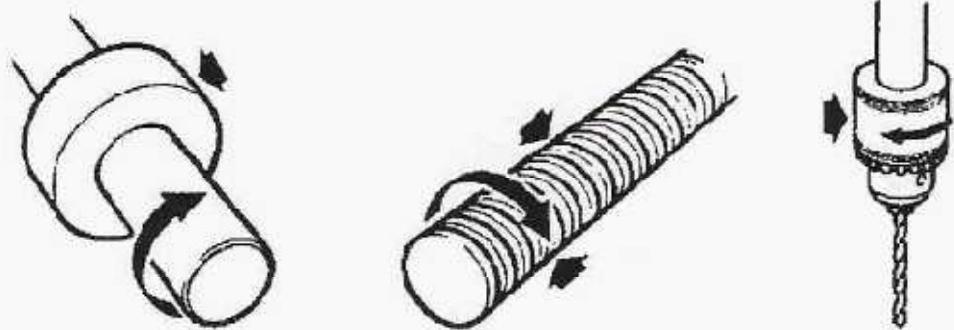
Entanglement (2)

Crushing (2)

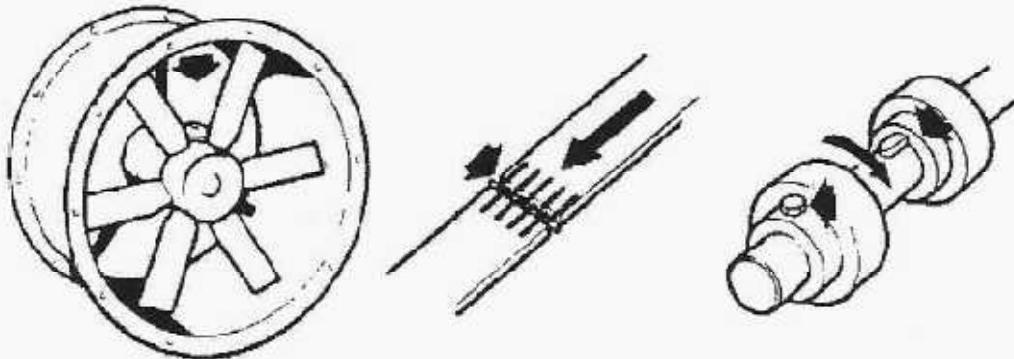
Drawing-in (2)

Shear (2)

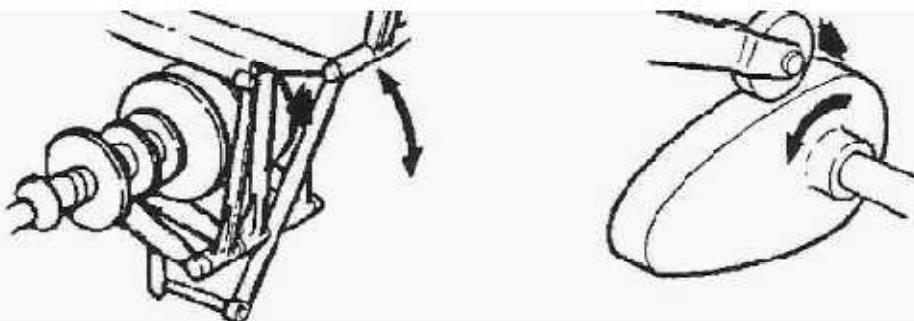
A21 No need for a masterpiece. Clear representation of machinery parts demonstrating each particular hazard. Arrows to show the direction of movement



Entanglement caused by contact with a single Rotating Surface

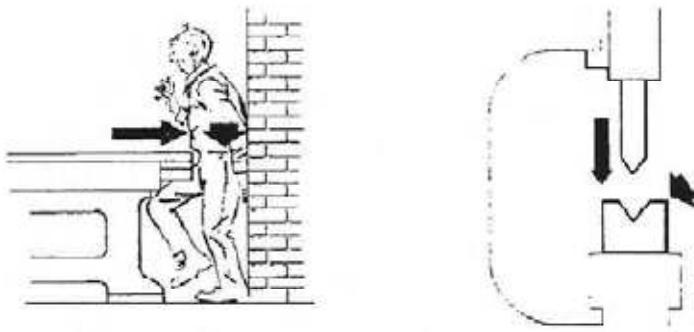


Entanglement caused by catching on Projections or in Gaps

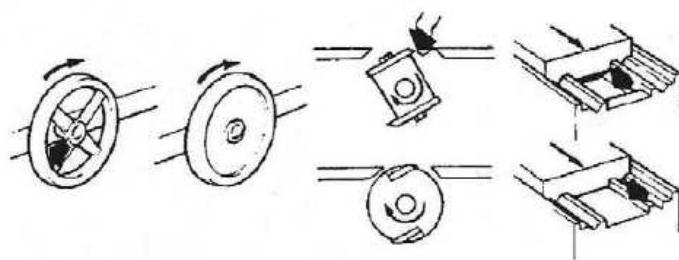
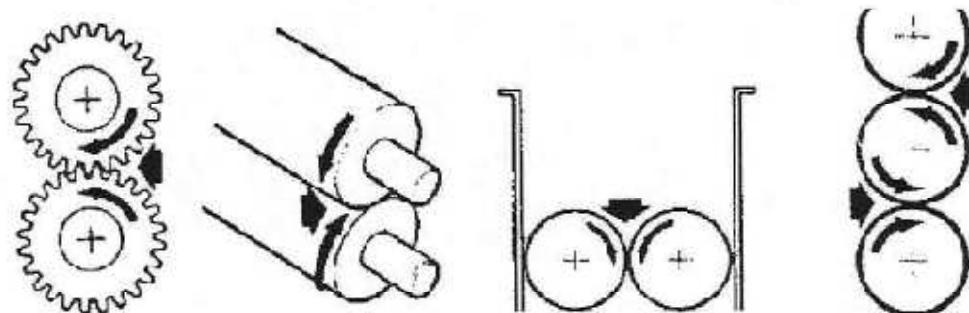


Entanglement caused by catching between Rotating and other Moving Parts

Crushing



Drawing-in



Four examples
of how Shear Traps have
been Eliminated by
Design

Q22 Outline the main considerations when deciding on the siting of fire extinguishers. (4)

A22 Accessibility

Visibility

Proximity to exits and escape routes

Travel distances

Support of the equipment off the ground

Free from obstruction

Protection from the weather

Protection from other sources of damage

Q23 Outline maintenance and inspection requirements for fire extinguishers. (4)

Inspection – routine i.e. monthly visual checks ensuring extinguishers are in place, have not been discharged and have no obvious damage.

Maintenance – annual tests by a competent person according to the manufacturer's instructions in order to ensure the extinguishers integrity, with faulty equipment being removed and replaced.

Q24 Explain these terms with regards to noise control.

Silencing (2)

Absorption (2)

Damping (2)

Isolation (2)

A24:

Silencing

The suppression of noise generated by the air flow, gas or steam in ducts and pipes, or when exhausted to the atmosphere, and uses either absorptive material or baffles

Absorption

Reduction of reflected noise by using materials such as foam or mineral wool

Damping

Reduction of amount of noise radiating from large panels and is effected by increasing the stiffness of the panels

Isolation

Physical separation of people from the noise source such as acoustic booths or havens, or by isolating the noise by vibration using flexible pipes or anti-vibration machine mounts

Q25 Outline a procedure for the safe lifting of a load whilst using a crane, ensuring the crane has been properly selected and positioned for the task. (8)

A25 The suitability of the lifting tackle such as its safe working load, free from defects, etc.

The competence of the people involved i.e. driver, slinger, signaller

The load must be lifted vertically, secure balanced and controlled during the lift by the use of tag lines whenever necessary

Proper communication

Area must be kept clear of non-essential personnel

Lifting, moving and lowering must be performed at the correct rate maintaining proper control at each part of the operation

Q26 Define the occupational health term “target organ”. (2)

A26 A part of the body that sustains an adverse effect when exposed to, or is contaminated by, a particular substance or agent. The harmful effects of a toxic substance confined to particular organs such as the lungs, liver, skin or kidneys.

Q27 Outline personal hygiene methods that would decrease the risk of ingesting a hazardous substance. (6)

A27 Regular hand washing

Restriction of smoking and eating in the workplace

P.P.E such as gloves

Removal and cleaning of contaminated clothing

Q28 Identify FOUR different types of hazards that could require the use of special footwear and **Explain** in EACH type how the footwear protects the wearer. (8)

A28 The types of special footwear and their uses are:

Falling objects – steel toe-caps
Sharp objects – steel in-soles
Flammable atmospheres – anti-static footwear
Spread of contamination – washable boots
Molten metal – heat resistant boots and gaiters
Electricity – rubber soles
Wet environments – impermeable Wellington boots
Slippery surfaces – non-slip soles
Cold environments – thermally insulated footwear

Q29 List the items to include on an inspection checklist for portable electrical appliances.(8)

A29 Appropriate equipment for the task and environment
Equipment is tested
Equipment, plugs, connectors and cables are free from damage
Correct wiring and sound connections
Fuses and other means of preventing excess current in place and correct rating
Accessible and appropriate means of isolation
System not overloaded

Q30 Outline the main precautions to be taken whilst undertaking an excavation project. (8)

A30 Detection of services using plans, cable/pipe detectors etc.
Supporting the sides
Storage of materials and spoil away from the edge
Measures to prevent vehicles falling into excavations such as stop blocks
Guard rails and barriers
Measures to prevent collapse of adjacent structures
Safe means of access/egress
Testing for, and ventilation of, noxious fumes
Measures to pump out water
Safe procedures for working with mechanical plant
Inspection, training and supervision

Q31State TWO asbestos related respiratory diseases. (2)

A31 Mesothelioma
Asbestosis
Lung cancer

Q32 Identify where you are likely to encounter asbestos in a building undergoing renovation work. (6)

A32 Pipe lagging
Wall and roof panels
Ceiling tiles
Textured coatings such as fire resistant encapsulation of metal girders
Insulation materials
Gaskets and other seals

Q33 List ways that may cause a fork-lift truck to become unstable when in use. (8)

A33 Insecure, excessive or uneven loading
Incorrect tilt and/or elevation of forks whilst traveling
Uneven or unconsolidated ground

Slopes and incorrect procedures to deal with them
Obstructions overhead and low level
Cornering at excessive speeds
Sudden breaking
Tyres in poor condition
Mechanical failure

Revision Questions & Answers from NEBOSH IGC Examinations

Element 1 Movement of people and vehicles - hazards and control

Lots of lists in this element. We know from experience that most of the pedestrian / vehicle questions that NEBOSH have asked over the years do require list-type answers.

We may find that the raised profile of these subject areas is, in time, reflected in the questions which NEBOSH ask.

Q1 Outline the most important factors in the management of (fork)-lift truck operation.

A1 The following factors are at the forefront of the management of (fork)-lift truck operation:

- select suitable staff: they need to be at least 17 years old (other requirements apply in industry specific regulations), medically fit and with the right disposition
- identify vehicles: different types of lift truck and attachments will require additional training
- identify work: the workplace environment, materials to be handled and work activities will impose additional training requirements
- identify training needs: by matching the individuals selected with the type of vehicle, work activity and workplace environment, a training programme can be developed in accordance with the Approved Code of Practice
(Remember that experienced operators may require conversion training.)
- provide training:
 - » either in-house or via a training centre
 - » ensure instructors are competent and adequate facilities are available
 - » training should cover: basic training, specific job training and familiarisation
- keep records: record the training undertaken by individual operators and certification awarded along with continuous assessment and test results
- authorisation: provide written authorisation to those allowed to operate lift trucks.
- monitor performance:
 - » keep an eye on operating procedures etc
 - refresher training: provide as and when necessary
 - health surveillance: provide routine medical checks for lift truck operators, particularly for those in middle age and above

Q2 Produce a check-list of key points for the design and layout of vehicle traffic routes.

A2 Design and layout of vehicle traffic routes, checklist of key points:

- ensure roadways are wide enough for the largest vehicle likely to use them.
- take account of the maximum number of vehicles and pedestrians entering or leaving the premises at the beginning and end of each shift.

- design road systems to provide minimum travel distances between places where vehicles have to visit.
- where possible eliminate the need for vehicles to reverse by, for example, the introduction of one-way traffic systems.
- where possible eliminate sharp bends and blind corners; where this is not possible provide suitable warning signs and mirrors
- keep road junctions and rail crossings to a minimum
- ensure entrances and gangways are wide enough to provide sufficient space to accommodate vehicles stopped for checking from causing obstructions
- ensure there are clear direction signs and identification markings on doors and buildings to help avoid driver error and unnecessary traffic movement

Q3 Ditto, a check-list of the key points for pedestrian traffic routes.

A3 Pedestrian routes need to be kept clear and unobstructed. The following key points, outlined

in the free HSE Publication Officewise (INDG173), are worth stressing with regard to pedestrian traffic routes:

- do not allow trailing leads to create tripping hazards
- do clear up spillages quickly
- do replace or repair torn floor coverings etc
- do provide handrails on stairways and ensure stairs are well lit
- do not block passageways or corridors

Obviously, the above precautions refer to ‘in the office’; management must also ensure that risk assessments also extend to encompass:

- pedestrian routes into and out of the building: do doors ‘suddenly’ open on to pavements, or on to vehicle routes
- car parking arrangements, and so on

Q4 Outline the most important general requirements concerning the conditions of floors and traffic routes.

A4 General requirements concerning the conditions of floors and traffic routes:

- sound construction
- sufficient strength and stability to meet the required demands
- surfaces should be even and free of faults
- special attention must be paid to surfaces which are liable to become slippery, for example in a machine shop with its oils and lubricants; in such an environment, floors should be non-slip and every effort should be made to contain the inevitable spills by mounting the machines in ‘trays’ and carefully designing the system of pipes and valves by which the machines can be drained of coolant oils and other fluids
- when any spills or a leakages do occur, they should be cleaned up immediately
- floors and traffic routes which are open to the elements should have ‘non-skating rink’ surfaces which may need to be gritted in spells of freezing weather

Q5 People and vehicles, what are the key requirements of The Workplace Regulations?

A5 People and vehicles, requirements of The Workplace Regulations:

- separation of pedestrians and vehicles
- careful design of crossing places

- signposting and the use of floor markings to indicate routes to be followed by internal vehicles
- ‘restraining’ barriers at sites where pedestrian routes suddenly emerge onto vehicle routes
- doors and gates
 - » use of transparent viewing panels
 - » safety features with power-operated doors
 - » safe use of upward opening doors
- consideration to be given to disabled people
- suitability of routes used by vehicles
- signposting of restrictions (headroom, presence of pedestrians, slopes, blind bends and so on)
- shielding and marking of dangerous obstructions such as overhead electrical cables or pipework
- protection of pillars and pipework from impact by vehicles (fork-lift trucks are very heavy - the author once saw such a truck drive into a set of storage racking at a snail’s pace, but still causing an amazing amount of damage)

Q6 What are the three main types of hazard faced by pedestrians?

A6 Slips, trips and falls; collisions; injury or damage caused by environmental conditions.

Q7 What are the main hazards causing slips, trips and falls on the same level?

A7 Wet or greasy floors, uneven or loose surfaces, and obstacles on the surface.

Q8 What are the four main environmental hazards?

A8 Lighting levels, heat, noise and air quality.

Q9 State four items that a risk assessment should consider in relation to potential hazards to pedestrians.

A9 There are many such factors. The following were given in the unit:

- The normal patterns of movement in and around the workplace
- Patterns of movement outside of those which are normal, whether authorised or not, and which may be reasonably predicted
- The particular needs of certain groups
- The needs of people not normally on the premises
- The influence of different weather conditions
- The influence of maintenance procedures
- Accident and incident reports
- How good are the existing measures and systems of work in providing adequate protection for pedestrians.

Q10 What is a designated walkway?

(5) Designated walkways are areas which are specially protected from hazards by segregating people from vehicles, and within which pedestrians should be reasonably safe from harm.

Q11 Where and how should hazard warning markings be placed?

(6) Hazard warning markings (yellow diagonal stripes on a black background) should be fixed as tape or painted onto any object likely to present an unforeseen hazard. In addition, they may be used to indicate areas to avoid, such as around doors used by vehicles, and to mark the edges of safe walkways.

Q12 What safety measures may be taken relating to doors?

A12 Four strategies are suggested:

- One-way systems through double doors
- Automatic doors or soft doors
- Hazard signals and warning lights on the doors themselves, and in surrounding areas
- Putting in viewing panel windows.

Q13 What are the three main types of hazard caused by vehicle operations?

A13 Loss of control, overturning and collisions with other vehicles, pedestrians or fixed objects

Q14 What may cause loss of control of a vehicle?

A14 Driver error, mechanical failure and environmental conditions.

Q15 What factors may contribute to the risk of overturning?

A15 Several factors may be involved, including:

- Speed of travel
- Steepness of the slope
- Height of the vehicle (including its load)
- Stability of the load
- High tyre pressure
- Any external longitudinal pressure, such as wind or colliding objects
- Presence and size of any bumps or holes in the surface.

Q16 Identify the environmental conditions which might contribute to accidents.

A16 Adverse environmental conditions include:

- Poor weather
- Poor lighting.
- Poor sight lines.
- Poor ground surface.
- Congestion.

Q17 How can visibility be improved?

A17 By ensuring adequate lighting is provided for the traffic route (and its surroundings), and by making sure that sight lines are good.

Q18 Identify the main safety measures used to manage vehicle operations and movement.

A18 Management of vehicle operations and movements includes the following measures:

- Movement systems
- Speed limits
- Vehicle parking
- Signs and markings
- Signalling
- Loading and unloading procedures
- Special rules for particular sites
- General rules to make sure vehicles do not become hazards.

Q19 On what key areas should vehicle safety maintenance concentrate?

A19 Vehicle safety maintenance should concentrate on:

- Braking systems

- Steering mechanisms
- Tyres
- Exhaust systems.

Q20 In what conditions should warning lights and alarm systems be used?

A20 Warning lights and alarms should be used to alert pedestrians and other drivers of the approach of a vehicle. They are particularly important at blind corners, junctions and doorways, and on reversing.

Q21 What special equipment should be fitted to vehicles to protect drivers?

A21 The main methods of protecting drivers are the use of seat belts, secured doors and protective cages and cabins with shatter-proof glass.

Q22 What are the main means of separating vehicles and pedestrians?

A22 There are three main means of separation:

- Barriers and/or clear surface markings to mark separate routes for pedestrians and vehicles.
- Designated crossing points for pedestrians to use when crossing vehicle routes.
- Separate doorways, etc., for pedestrians.

Element 2 Manual and Mechanical hazards and control

Q1 What are the factors to take into account when making a manual handling assessment?

A1 A manual handling assessment must take into account the following (but not necessarily in the order shown here):

- T task
- I individual
- L load
- E environment

If you are not able to illuminate each of these with a couple of examples, refer back to the study material.

Q2 Who might be responsible for the manual handling assessment in a particular workplace?

A2 Responsibility for conducting a manual handling assessment: the answer to this question is the same general answer we always give when we consider who is able to undertake a particular risk assessment in a particular workplace, namely the person(s) who separately or together have a thorough knowledge of the work activities in question. If no such person(s) are available, then serious questions must be raised concerning both the working practices and the training staff have received. Exceptions to this requirement that in-house staff should be able to undertake the necessary risk assessments will arise with specialised equipment such as steam boilers and certain lifting equipment where outside expertise (perhaps provided by insurance companies) may be needed. In the IGC2/2 study material we outlined the specific in-house expertise that might be called upon in a manual handling assessment.

Q3 Causes of manual handling accidents and common manual handling injuries - together the basis of many NEBOSH questions over the years, generally not difficult and one that should reward you with good marks. Accordingly, provide an answer ...

A3 Causes of manual handling accidents and injuries:

- slips, trips and falls
- poor lifting techniques

- loads which are too heavy for the individual concerned
- loads with sharp corners
- deceptive loads: either because they are unexpectedly heavy or because the centre of gravity is not as anticipated
- poor posture
- repeated handling and manipulation of loads which might be acceptable as a ‘one-off’.

Common injuries include:

- strains and muscle injuries involving the spine
- strains and muscle injuries involving other parts of the body
- scratches, bruising and grazes (mostly to the upper body)
- fractures, either as a result of falls or dropping heavy objects onto the body

Other common manual handling questions ask the candidate to list groups of workers who are particularly at risk when it comes to manual handling injuries. A good answer will supply, perhaps, four or five at-risk groups together with a brief outline of work they undertake and the injuries likely to be encountered.

Q4 Outline some other general points concerning manual handling techniques

A4 Additional manual handling techniques include:

- using a midway stage which may, for example, be valuable when an object has to be lifted from the floor to a high shelf
- making use of the strong leg muscles to push an object into (storage) position
- team handling - using two people in certain manual handling operations
- ensuring that workers are aware of the most efficient ways of manoeuvring equipment such as trolleys
- avoiding unnecessary stretching
- use of ‘kinetic handling’ techniques

Q5 Explain, giving a few details, how avoiding the need for a particular manual handling operation can be achieved by: elimination of handling, or if this is not possible, automation.

A5 Avoiding the need for a particular operation ...

Elimination of handling

- are certain handling operations necessary?
- can the same results be achieved another way?
- can a process such as machining or wrapping be carried out in situ, without handling the load? Automation or mechanisation, if the load handling operations cannot be avoided entirely:
- can the operation be mechanised - for example, the use of roller conveyors
- is automation a possibility?

Q6 Under the following motion of machinery hazard categories (IGC2/3), **give** some examples

of hazards specifically associated with handling equipment:

- entanglement
- friction and abrasion
- cutting
- shear
- stabbing and puncture
- impact

- crushing
- drawing in

A6 Handling machinery hazards, some examples:

- entanglement: rollers on conveyor systems, drum and cable lifting devices
- friction and abrasion: any handling system involving belts (very tough, very abrasive) for the movement of grain, coal, sand; simple building site rope and pulley systems
- cutting: hard to think of a specific handling cutting example, apart from the side edge of a travelling conveyor belt, although obviously many of the other categories included here might also involve cutting
- shear: lift moving across the opening in a lift shaft; any lifting equipment that makes use of scissor-action
- stabbing and puncture: any fast moving handling equipment might, either on its own, or through the articles being carried cause this type of injury
- impact: clearly just about any moving handling equipment could cause an impact injury ('traffic hazards, IGC2/1); we should also mention the impact effects of equipment such as fork-lift trucks hitting storage racking, brick walls and so on - the damage that can be caused by even a very slow moving vehicle can be quite remarkable: buckling and toppling storage racks and so on
- crushing: device such as an inspection platform pushes the worker on the platform into the ceiling, ventilation ducting etc
- drawing in: roller and screw conveyor systems for moving bulk materials

Q7 In addition to the motion of machinery hazards of the previous question, **outline** some other

hazards associated with handling equipment.

A7 Other hazards associated with handling equipment

- electrical hazards from the powerful batteries used in milk floats, hand-operated trucks etc
- falls from height
- toppling over of lifting equipment (you should be able to suggest a few possible causes)
- electrostatic effects leading to fire and explosion hazards (think conveyor systems with the build-up of dust, frictional generation of electrostatic charges etc)

Q8 What are the main causes of injury to workers as a result of manual handling operations?

A8 The main causes of injury are:

- Failing to use a proper technique for lifting and/or moving the object(s) or load
- Moving loads which are too heavy
- Failing to grip the object(s) or load in a safe manner
- Not wearing appropriate personal protective equipment.

Q9 What is a WRULD and how might it be brought about?

A9 WRULD stands for "work related upper limb disorder" and refers to ill-health conditions affecting the upper limbs, particularly the soft connecting tissues, muscles and nerves of the hand, wrist, arm and shoulder.

WRULDs arise from the repetition of ordinary movements (such as gripping, twisting, reaching or moving), often in a forceful and awkward manner, without sufficient rest or recovery time.

Q10 What is the primary means of minimising the hazards of manual handling?

A10 The elimination of risk by the use of mechanical aids.

Q11 What are the characteristics of the load which may present a hazard?

A11 The characteristics of a load which constitute a hazard are its weight, size, shape, resistance to movement, rigidity or lack of it, position of its centre of gravity, presence or absence of handles, surface texture, stability of any contents and the contents themselves.

Q12 Identify the main hazards presented by the working environment in relation to manual handling operations.

A12 The main hazards in the working environment are:

- Restrictions on movement and posture
- Conditions of floors and other surfaces
- Variations in levels
- Temperature and humidity
- Strong air movements
- Lighting conditions.

Q13 How can manual handling tasks be re-designed to make them less hazardous?

A13 Re-design of the task may include:

- Sequencing – adjusting the sequence of tasks in a process to minimise the number of operations involving lifting and carrying loads.
- Work routine – reducing repetitive operations to allow variation in movement and posture, by such means as introducing breaks, job rotation and providing ways in which workers can operate more at their own pace, rather than the work being controlled by a continuous supply of materials to be handled.
- Using teams – sharing the load by using teams of workers to carry out the task.

Q14 What are the most common hazards associated with:

- (i) Fork-lift trucks
- (ii) Lifts and hoists
- (iii) Cranes
- (iv) Sack trucks?

A14

- (i) The most common hazard of lift trucks is that, with their small wheels and particularly when loaded and with the forks raised, they may become unbalanced, resulting in them shedding their load or tipping over. Other hazards arise from the constant need to reverse the truck, obscured vision when the load is raised and using unsuitable trucks for the working environment.
- (ii) The main risks associated with lifts and hoists are falls from a height (from a landing level, from the platform or with the platform) and being hit by materials falling from the platform. Other hazards include being struck by the platform or other moving parts, and being struck by external objects or structures while riding on the platform.
- (iii) The main hazards associated with cranes are the risk of them becoming unbalanced and toppling over, the arm of the crane swinging out of control or the load striking something whilst being moved horizontally or falling.
- (iv) The main hazards of sack trucks are overloading, instability of the load, tipping when moving over uneven ground or on slopes, and careless stowage.

Q15 What personal protective equipment might be appropriate for working with:

- (i) Pallet trucks
- (ii) Cranes?

A15

- (i) Safety footwear, as well as gloves and aprons to protect whilst handling loads.
- (ii) Safety helmets.

Q16 How can entry to and exit from lifts be made safe for people?

A16 The main means of protection is the use of interlocking gates which ensure that access to and egress from the lift platform is only possible when the lift is at rest. Other relevant safety measures include the positioning of the operator so that each access point can be seen or the use of signallers to inform the operator that it is clear.

Element 3 Work equipment hazards and control

Q1 How is work equipment defined, give some examples.

A1 Work Equipment is defined as what is and what isn't work equipment. Although you probably think that this answer is a little evasive, such a statement should form part of your answer together with some examples which fall within the definition of work equipment: lawn-mower, photocopier, hand saw and some examples which fall outside the definition of work equipment: livestock, substances, structural features such as walls.

Q2 Describe, giving examples, what is meant by 'mobile work equipment', MWE.

A2 MWE includes any equipment which carries out work whilst it is travelling (dumper, fork lift truck, crop sprayer) or which travels between different locations where it is used to carry out work (compressor, trench diggers, mobile platform for inspecting street lights).

Q3 Briefly **outline** some of the legal requirements which apply specifically to MWE.

A3 No employee shall be carried on MWE unless it is suitable and incorporates features to prevent persons falling under wheels and tracks. Roll-over protection ...

Preventing unauthorised start-up; starting, stopping, emergency stopping; driver's field of vision;

lighting for use in the dark; carriage of fire appliances and so on,

Remote / robotic controlled self-propelled work equipment must stop automatically if it leaves its control range and risks of crushing and impact must be guarded against.

Protection against the hazards associated with the transmitting power from one piece of work equipment to another, for example the power take-off shaft from a tractor to a hay baler.

Q4 In developing a training programme which will satisfy the needs of legal requirements, three particular aspects of work will need to be addressed - what are they?

A4 The three aspects of work that will need to be encompassed in a training programme will be:

- day to day operation of the equipment - starting, stopping, loading, unloading and so on
- foreseeable abnormal situations such as a drill bit shattering or a tyre puncturing
- what the HSE describe as 'conclusions to be drawn from experience in using the work equipment' which means that, following training, the worker should have sufficient knowledge to be able to make constructive criticism about the equipment and its use in the workplace in question.

Q5 When developing the training programme, what factors will need to be considered as far as

the needs of individual workers are concerned?

A5 It will be necessary to consider the employees' age and existing competence and hence what additional training will be necessary to enable them to use, supervise or manage the use of the work equipment with due regard to health and safety. (It is important to remember that an employer has an obligation to train not only to those who use work equipment but also to those supervising or managing.)

The training programme should also take account of the circumstances in which the employee is to work (alone, under close supervision of a competent person or whatever).

Q6 How can you define the motion of machinery parts?

A6 Machinery motion may be described as being a combination of rotary and linear motion; (reciprocating movement can be seen as a form of linear motion).

Q7 There are various different ways of classifying the mechanical hazards associated with machinery motion; in our study material we have chosen to use a common classification which divides mechanical hazards in eight categories; the first is entanglement, can you list the other seven?

A7 The mechanical hazards associated with machinery motion may be classified as follows:

- entanglement
- friction or abrasion
- cutting
- shear
- stabbing or puncture
- impact
- crushing
- drawing in, which might lead to one or more of the above hazards

Q8 Define the following terms (some of which you have defined in IGC1/1):

- machinery
- hazard
- risk
- safeguard
- guard
- safety device
- safe working practice or safe system of work
- interlock
- failure to danger
- failure to safety (the preferred term is now 'failure to minimal danger')
- integrity

A8 Definitions

- machinery is apparatus for producing or applying power, having fixed or moving parts each with definite functions
- a hazard has the potential to cause personal injury or ill health
- risk is a measure of the likelihood that a hazard will result in harm together with the resulting severity
- a safeguard is a guard or device designed to protect persons from danger

- a guard is a physical barrier that prevents or reduces access to a danger point
- a safety device is a device other than a guard that eliminates or reduces danger
- a safe working practice or safe system of work is a method of working that eliminates or reduces the risk of injury
- an interlock is a safety device that interconnects a guard with the control system or the power system of the machinery
- failure to danger is any failure of the machinery, its associated safeguards, its control circuits or its power supply that leaves the machinery in an unsafe condition
- failure to minimal danger is any failure of the machinery, its associated safeguards, control circuits or its power supply that leaves the machine in a safe condition, or rather, a condition of minimal danger
- integrity is the ability of the devices, systems and procedures to perform their function without failure or defeat

Q9 Outline the hierarchy of control which is appropriate for machine safety.

A9 The hierarchy of control which is appropriate for machine safety: having assessed the risk posed by the machinery in question, the solution must then be chosen through the hierarchy of

controls (we have added a few notes under each heading):

- substitution, the use of a safer machine remember that there are legal requirements for purchase of new machinery
- engineering control to reduce the severity of harm and the likelihood of harm arising from the hazard in question
- administrative control including the establishment of appropriate working procedures for day to day operation and cleaning and maintenance and emergency procedures
- personal protective equipment if all other measures fail to achieve sufficient control

Q10 Matching Shakespeare's seven ages of man, we came up with the eleven stages in the life of a machine - what are they, starting with the design of the machine?

A10 The eleven stages of machine:

- design
- construction
- transport
- installation
- commissioning
- operation, including start-up and shut-down
- setting or process change-over
- cleaning
- adjustment
- maintenance
- decommissioning and dismantling

Q11 The selection of guards forms one step in the hierarchy of control of machines - what is the common aide-memoire used to show the order of preference for the selection of guards? You should be able to provide examples of the various types of guard.

A11 Selection of guards: F I A T. Fixed guards being the first choice, followed by interlock guards, automatic guards and fina.

Q12

- (i) From what do the risks in the use of hand tools arise?
- (ii) From what do the additional risks of portable power tools arise?

A12

- (i) The risks in the use of hand tools arise from operator error, misuse and improper maintenance.
- (ii) The additional risks of portable power tools arise from the presence of the power source (and especially the electrical cables) and the speed and force of the tool itself.

Q13 Why might each power tool be marked?

A13 To identify it for inspection purposes as part of a routine maintenance system.

Q14 What are the general factors about machines and the way in which people may come into contact with them which cause the specific mechanical hazards in any situation?

A14 There are six general factors:

- Shape of the machine— for example, whether an object has sharp edges, angular parts, etc., which may be a hazard even if not moving.
- Relative motion of machine parts or of a machine part to a body, or part of a body.
- Mass and stability of the machine or parts of it, including the workpiece.
- Acceleration of moving parts of a machine (or the workpiece), either under normal conditions or if something breaks.
- Inadequate mechanical strength of a machine or part of it.
- Potential energy of elastic components which may be translated into movement.

Q15 What are drawing-in injuries?

A15 These occur where a part of the body is caught between two moving parts and drawn into the machine.

Q16 List the non-mechanical hazards arising from the use of machinery.

A16 Noise, vibration, electricity, temperature, hazardous materials and substances (including radiation) and ergonomics.

Q17 What hazards might arise from the use of the following machines?

- (i) Bench top grinder
- (ii) Simple robot
- (iii) Pneumatic drill
- (iv) Bench-mounted saw

A17

- (i) Bench top grinder: Mechanical – contact, ejection of parts, swarf Non-mechanical – dust
- (ii) Simple robot: Mechanical - impact/crushing Non-mechanical – noise
- (iii) Pneumatic drill: Mechanical - impact/crushing Non-mechanical – noise, vibration, dust
- (iv) Bench-mounted saw: Mechanical – cutting/severing Non-mechanical – noise, dust

Q18 What is the hierarchy of protective measures?

A18 The hierarchy of protective measures referred to in the text is as follows:

- Fixed enclosing guards
- Other guards or protection devices
- Protection appliances
- The provision of information, instruction, training and supervision.

Q19 What five requirements are there for any guarding system?

A19 That they should:

- Be compatible with the process
- Be of adequate strength
- Be properly maintained
- Not increase risk
- Not be easily bypassed or disabled.

Q20 Describe the principles of an interlocking guard system.

A20 Interlocking guards comprise a system which links the opening of the primary guard to the operation of a second safety device, leading either to the complete stoppage of the machine or to the operation of another guard.

Q21 What is a trip device?

A21 A trip device is a system which stops or reverses the motion of a machine when a person enters the hazard area.

Q22 What are the limitations of adjustable guards?

A22 There are two potentially serious limitations:

- They can easily be defeated
- They rely upon operators being 100% vigilant in providing for their own safety, a condition the guard should provide, not the operator.

Q23 What are protection appliances?

A23 These are hand held tools or hand controlled fixed devices which are used to hold or manipulate a workpiece as it enters the machine, is worked on and/or removed from the machine. They allow the operator to keep control of the piece whilst not coming into contact with the hazardous parts of the machine. They include push sticks, jigs and other types of holder.

Q24 How may two-handed controls be over-ridden?

A24 Two people can over-ride the system by each holding one handle.

Q25 When are operators required to be trained in the use of safety equipment?

A25 At all times and in all situations.

Element 4 Electrical hazards and control

For many people, electricity seems to be perceived as a subject of special obscurity and complexity; for this reason, in the Electrical hazards and control element, we decided to adopt a different approach to usual, namely exposing students very early in their study to typical NEBOSH Certificate examination questions.

Q1 Define the meaning of the following terms which are listed in the syllabus: competence, earthing, isolation, insulation, protection, reduced voltage, excess current protection, residual current device and duty holder.

A1 Definitions

- Competence is defined as those working on electrical equipment must have the necessary knowledge and experience or be under appropriate supervision.

Maybe you feel that this is a slightly evasive or circular definition but you try to think of a

better way of expressing the concept of competence.

- Earthing ... very low resistance electrical connection to the Earth, which, in the event of a fault will allow excess current to flow away; this flow to earth should trigger the operation of a safety device such as a fuse or a rcd.
 - Insulation ... material of such a high electrical resistance that no electrical current will flow through it.
 - Protection ... the usual meaning of the word - as we have stressed, protection which is appropriate to prevent irreparable damage to a piece of equipment (for example, a fuse) may be insufficient to prevent irreparable damage to a person (the very rapid circuit breaking action of a rcd is needed to protect people).
 - Reduced voltage ... most types of electrical power tool can be produced in versions which operate off 110 volts rather than the normal mains 230 volts. Because of the way the electrical circuits for such equipment are constructed ('centre-tapped'), in effect the voltage to which a victim might be exposed is reduced by a factor of four. However, because 55 volts is still capable of producing a fatal shock, other forms of protection (rcd) will still need to be incorporated in the electrical circuit.
 - Excess current protection ... if excess current is flowing in an electrical circuit, something is wrong, and devices such as the fuse and the rcd are needed to provide the required level of protection.
 - Residual current device ... very fast acting electrical device which will break the circuit if it detects that electrical current is any way being 'spilled' from the circuit - that is actually the significance of the word 'residual'. Please speak to your tutor or phone us in Chichester if you wish to discuss further.
 - Duty holders ... we can identify three groups of duty holder, namely: employers, self-employed people and employees each with their specific duties which relate to matters which are within the control of each of these groups; the Regulations require employer / employee co-operation.
- when this is necessary.

Q2 What does 'double insulation' mean?

A2 Double insulation is an appropriate form of protection in equipment which no exposed metal

parts may not need to be bonded to earth (earthed) and the electrical circuit will comprises line (brown) and neutral (blue). The second level of insulation ('double insulation') in such equipment may be provided by plastic casing of the equipment.

Q3 What is the voltage of a circuit?

A3 Voltage is the measure of difference in electrical potential between the two terminals of a circuit.

Q4 What determines the current in a circuit?

A4 The current in a circuit is determined by the voltage.

Q5 What is the difference between resistance and impedance?

A5 In principle, there is no difference as both terms relate to the slowing of the flow of electricity through a circuit. Generally, resistance relates to the components connected to a circuit whereas impedance relates to resistance within the conductor itself.

Q6 What is a short circuit?

A6 A short circuit is formed where another conductor touches the circuit and provides the electricity with an alternative path to a terminal with a larger potential difference than the neutral terminal, usually the earth.

Q7 What does arcing do?

A7 Earthing provides a safe path for any faulty current to be dispersed to earth through a designated conductor.

Q8 What is the main effect of electric shock on the body?

A8 An electric shock results in a convulsive response by the nervous system to the passage of electricity through that part of the body, causing the muscles to contract, often violently.

Q9 If a person receives a shock for one second which passes through the body along a path with an impedance of 10,000 ohms, what would be the current received and what effect might it have on the person if the voltage of the circuit touched was:

- (i) 240 volts
- (ii) 110 volts
- (iii) 50 volts?

A9 Using the equation for calculating current from Ohms Law and expressing the result in milliamps:

	$I = \frac{V}{R}$	This will cause strong muscle contraction and possibly some breathing difficulties.
(i)	$= \frac{240}{10,000} = 24 \text{ mA.}$	
(ii)	$I = \frac{V}{R}$ $= \frac{110}{10,000} = 11 \text{ mA.}$	This will be painful and there will be some muscle contraction.
(iii)	$I = \frac{V}{R}$ $= \frac{50}{10,000} = 5 \text{ mA.}$	This will be barely perceptible, perhaps some mild tingling will be felt.
(i)	$I = \frac{V}{R} = \frac{240}{10,000} = 24 \text{ mA.}$	This will cause strong muscle contraction and possibly some breathing difficulties.
(ii)	$I = \frac{V}{R} = \frac{110}{10,000} = 11 \text{ mA.}$	This will be painful and there will be some muscle contraction.
(iii)	$I = \frac{V}{R} = \frac{50}{10,000} = 5 \text{ mA.}$	This will be barely perceptible, perhaps some mild tingling will be felt.

Q10 What is the first step in treating a victim of electric shock?

A10 The first action should be to break any continuing contact between the victim and the current.

Q11 What is arcing and what risks does it pose?

A11 Arcing is the electrical bridging through air of one conductor with a very high potential to another nearby earthed conductor. If the arc is connected to a person, the victim may be subject to both a flame burn from the arc and electric shock from the current which passes through the body. There is also a danger of burns from ultraviolet radiation and radiated heat, even where the arc does not actually touch a person. Arcing can also provide a source of ignition for fire.

Q12 Why are cable drum extension leads dangerous?

A12 The bends in the cable increase resistance and may cause overheating of the conductor.

Q13 What five factors should be used to assess the suitability of the construction of an electrical system?

A13 The factors to be considered when evaluating the suitability of the construction of electrical systems are:

- The manufacturer's recommendations
- The likely load and fault conditions
- The probable use of the system(s)
- The need for suitable electrical protection devices, such as overload protection
- The environmental conditions which may affect the mechanical strength and protection required.

Q14 What protection is offered by the cord grip in a plug?

A14 A cord grip restricts movement at the point of entry of the flexible cable into the plug, thus preventing abrasion of the cable. It also prevents the conductors being pulled loose from their terminals.

Q15 What is the difference between a fuse and a circuit breaker?

A15 A fuse forms a weak link in a circuit by overheating and melting by design if the current exceeds the safe limit. A circuit breaker is a mechanical device in the form of a switch which automatically opens if the circuit is overloaded.

Q16 What is the purpose of a fan in an item of electrical equipment?

A16 A fan is designed to disperse excess heat generated by the normal operation of the equipment. It is not designed to prevent overheating from electrical faults.

Q17 What is equipotential bonding?

A17 Equipotential bonding is the process of connecting all external metalwork in the system to a common bonding conductor, thus ensuring that all the metalwork is at the same potential and, if any of the metal fittings become live, current will not flow through the system.

Q18 What is the difference between switching off and isolation?

A18 Switching off refers to depriving the equipment of electric power, but still leaving it connected. Isolation refers to physically separating it from any source of electric power, with the additional step being taken of ensuring that it cannot be inadvertently re-energised.

Q19 What protection is offered by a reduced voltage transformer in a circuit?

A19 Reduced voltage circuits reduce the effect of any shock received from making contact with part of the circuit.

Q20 State the main features of a proper system of maintenance.

A20 The main elements of a proper system of maintenance are:

- Identification of the equipment which has to be maintained and where/how it is to be used
- Discouragement of “unauthorised” equipment in the workplace
- Carrying out simple user checks for signs of damage; for example, casing, plug pins and cable sheath
- Formal visual inspections carried out routinely by a competent person
- Periodic testing of equipment by a competent person
- Systems for the reporting and replacement of defective equipment
- Recording of all maintenance and test results along with the inventory of equipment in use.

Q21 What checks should be carried out before an item of electrical equipment is used?

A21 The person utilising the electrical equipment should visually check for signs that the equipment is not in sound condition; for example:

- Damage to the cable sheathes, joints or plugs
- The equipment has been subjected to conditions for which it is not suitable; for example, it is wet or excessively contaminated
- Damage to the external casing of the equipment or there are loose parts or screws.

Q22 What is the safest method of powering electric hand tools which are being used outdoors?

A22 If they cannot be powered by battery, the electrical power should be delivered through a reduced voltage circuit and/or protected by a residual current circuit breaker.

Element 5 Fire hazards and control

Q1 What are the essential elements necessary for fire to occur; explain the implications for fire control.

A1 Essential elements for fire to occur or continue.

Here you should have described the fire triangle, emphasising that removing any side of the triangle will prevent the fire from starting (fire precautions) or will stop a fire that has started (fire fighting).

As we have pointed out, almost any question on the prevention and fighting of fire can be answered, at least in part by appropriate mention of the fire triangle. A rich answer would explain that the heat side of the triangle is actually formed of two components - the heat to create a vapour (because it is the vapour that actually burns, not the solid or liquid itself) plus the energy to ignite the vapour. Some authorities have argued that it might thus be preferable to talk of a fire ‘square’ but it seems as if the triangle is now too well established to be replaced.

Q2 Explain the terms: exothermic and oxidising.

A2 Exothermic, oxidising

- exothermic: a reaction that gives out heat as it takes place
- oxidising: the reaction consumes oxygen (strictly, chemists may provide a different definition,
but this will suffice for our purposes)

Q3 Briefly **describe** some common causes of fire.

A3 Common causes of fire include:

- delayed discovery allowing development into a major fire
- combustible material not properly stored - or disposed of
- presence of explosive dusts, gases or vapours
- presence of flammable material (for example, flammable liquids) in unsuitable containers
- poor building design combined with lack of appropriate fire stopping measures - inadequate fire doors, roof voids and cavity walls which allow fires to develop and spread without being detected and so on
- use of combustible materials in construction
- windows and / or doors accidentally or intentionally left open
- vandalism resulting in the disabling of fire fighting systems
- arson

Imagine now that the question had asked for the ‘principle sources of ignition for fires’ – although there is obviously an overlap with this ‘common causes’ question, your answer should focus on ignition sources such as friction, static electricity and so on. (Make sure that you can indeed list and describe seven or eight sources of ignition.)

Q4 **Describe** the basic methods of heat transfer in the spread of fire

A4 Basic methods of heat transfer in the spread of fire:

- conduction (for example: along pipes, through brickwork)
- convection (via the space above false ceilings, up stairwells)
- radiation (from a burning building or trees across a distance of many metres)
- direct burning ('eating' steadily along - remember what we said about this)

Q5 **List** the four methods heat transfer by which the human body can loose heat. Which of these cannot be involved in heat gain?

A5 The body may loose heat by the three basic means of heat transfer - conduction, radiation and convection plus heat loss via sweating (in many situations, the most important means of heat loss). Heat cannot be gained by sweating.

Q6 **Define:**

- spontaneous ignition temperature
- lower flammable limit
- upper flammable limit

A6 Definitions

- spontaneous ignition temperature is the lowest temperature at which a substance will ignite spontaneously without any external source of ignition: coal tips, haystacks and oil soaked rags are some examples
- lower flammable limit is the smallest concentration of flammable gas or vapour which, when mixed with air, is capable of ignition and subsequent flame propagation
- upper flammable limit is the highest concentration of flammable gas or vapour which, when mixed with air, is capable of ignition and subsequent flame propagation

Q7 Fire detectors operate by sensing a change in one or more of three physical / environmental factors - what are they? You should also be able to briefly **describe** the method of operation of these detectors.

A7 Fire detectors are intended to detect an outbreak of fire/smouldering in its early stages by

sensing one or more of the following:

- heat detectors and flame detectors have three basic operating principles:

- » fusion (melting)

- » expansion

- » infra-red flame and smoke detectors

- smoke detectors generally fall into three categories:

- » ionisation detectors

- » light scatter detectors

- » obscuration detectors

(Make sure that you can briefly describe all these.)

Q8 Outline the operation of the two main types of automatic sprinkler system.

A8 Sprinkler systems may be divided into two main types:

- wet systems where the pipework is fully charged with water at all times and thus there must be

- no danger of the water freezing

- dry installations are installed where the temperature conditions are artificially maintained close

to, or below freezing, for example in cold stores; the pipes are kept charged with air under sufficient pressure to hold back the water supply

Q9 Fires and fire extinguishers are classified as Class A–D, F. Briefly **outline** the characteristics

of each Class. What has happened to Class E? What colour are the fire extinguishers for each Class?

A9 Classes of fire and fire extinguishers

- Class A Fires involving solid materials - paper, wood, fabrics. Cooling by water or spray foam is the most effective way of extinguishing this type of fire.

- Class B Fires involving flammable liquids such as petrol, oils, fats; foam and dry powder extinguishers should be used.

- Class C Fires which are fuelled by flammable gases such as North Sea Gas, butane and so on. Priority must be given to shutting off the source of fuel and the fire should be tackled with dry powder.

- Class D Metal fires involving metals such as aluminium and magnesium; special powders are required in such situations.

- (Formerly known as Class E Fires) in which live electrical equipment is involved. For such fires, non-conducting agents such as powder and carbon dioxide must be used; if those fighting the fire can, with certainty, disconnect all electrical power, then the fire can be treated

in terms of its appropriate Class, A–D, F.

- Class F High temperature ($>360^{\circ}\text{C}$) cooking oils used in large industrial catering kitchens, restaurants, takeways etc; wet chemical fire extinguishers are required.

All extinguishers are now to be coloured red although the old coding system (cream for foam extinguishers etc) can be retained as a coloured strip on the extinguisher.

Q10 What are the six main factors to be considered when assessing a building with regard to means of escape in the case of fire?

A10 The main factors to be considered when assessing a building with regard to escape in the case of fire are as follows:

- construction of building (layout and materials)

- time needed for the complete evacuation of the building
- type of occupancy
- number and location of exits
- travel distances to the exits
- management control

Q11 What is the purpose of emergency lighting?

A11 Emergency lighting may be classed as ‘maintained’ (in operation at all times), ‘non-maintained’ which is triggered when the normal lighting fails and ‘stand-by lighting’ which provides a full replacement system in areas such as an operating theatre or a control process control centre.

Emergency lighting has three functions:

- indicate escape routes
- provide sufficient illumination along such routes to permit safe escape in case of fire
- ensure that fire alarms and fire fighting equipment situated along the escape route can be readily located.

Q12 Sketch a diagram of a fire notice.

A12 A fire notice should encompass the following:



• Fire officer	Room	Phone number	•
Deputy	Room	Phone number	
FIRE ACTION			
Raise the alarm			
By operating the nearest breakglass fire alarm call point			
Do not be afraid to shout "FIRE"			
Warn others			
CALL FIRE BRIGADE			
In the day phone			
At night			
ON HEARING THE ALARM			
If time permits, put important documents in a steel cabinet			
Leave via the nearest fire exit			
Do not use lifts			
YOUR ASSEMBLY POINT IS			
.....			
Do not stop to collect personal belongings			
If you feel it is safe to do so, attack fire with available equipment			
Do not re-enter building until told it is safe by the fire brigade			•

Q13 Briefly **outline** the factors that may be involved in causing a dust explosion; what measures

may be taken to minimise the risk of such explosions?

A13 Measures to reduce the risk of dust explosions include:

- good housekeeping
- engineering control by use of exhaust ventilation to gather up and dispose of excess dust
- control of electrostatic sources by the use of earthing and so on

Q14 Outline five or six key factors in the prevention of liquid fires.

A14 The key to the prevention of liquid fires is to control the formation of vapour:

- contain the liquid so that vapour does not escape during storage
- handle the liquid so that spillages are contained and disposed of appropriately
- provide ventilation so that any vapour which is created is dispersed
- control ignition sources - static electricity, electrical equipment, cigarettes, naked flames
- treat 'empty' containers as if they were full
- keep 'immediate use' supplies in small quantities in metal cupboards
- keep bulk stocks in fire-resisting stores

Q15 Ditto the prevention of fires involving flammable gases.

A15 Prevention of fires involving flammable gases such as oxygen and acetylene:

- the preferred option is to site gas cylinders outside the building and to pipe the gas through fixed pipework to where it is needed; where this is not possible, for example with mobile welding sets, it will be necessary to take the gas cylinders to the place required and protect them by chaining in racks or trolleys

- operators must be trained in the correct use of flammable gases: changing cylinders, checking valves and connectors, testing for leaks, working procedures
- ensuring good ventilation
- storage of full and empty cylinders (preferably in secure, well-ventilated stores in outside buildings, never below ground level or next to drains and similar)

Q16 What is likely to happen if you open a window to release the dense smoke in a room created by a fire?

A16 The smoke may begin to clear but by allowing fresh air into an oxygen-depleted environment the fire is likely to burn with increased intensity.

Q17 Explain briefly how each of the following might start a fire.

- (i) Static electricity
- (ii) Friction
- (iii) Space heater

A17

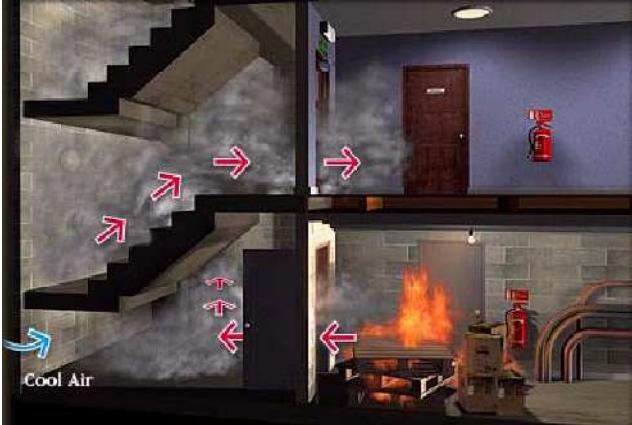
(i) Static electricity is an electrostatic charge produced by friction or induction. The charge may be transported a considerable distance from the point of origin and a spark may be produced when sufficient charge accumulates. This spark may have enough energy for ignition.

(ii) Friction is the process whereby heat is given off by two materials moving against one another. In the absence of a lubricant or cooling substance it can result in the surfaces of the materials becoming hot or actually producing sparks, either of which may be sufficient to cause ignition. Friction can be caused by impact (one material striking another), rubbing (when moving parts of a machine contact stationary surfaces) or smearing (for example, when a steel surface coated with a softer light metal is subjected to a high specific bearing pressure with sliding or grazing).

(iii) A space heater is designed to give off considerable heat and, close to the heater, temperatures may be very high. Fire may be started by combustible materials being placed too close to the source of the heat (through radiation) or by actually touching the hot surfaces of the heater itself.

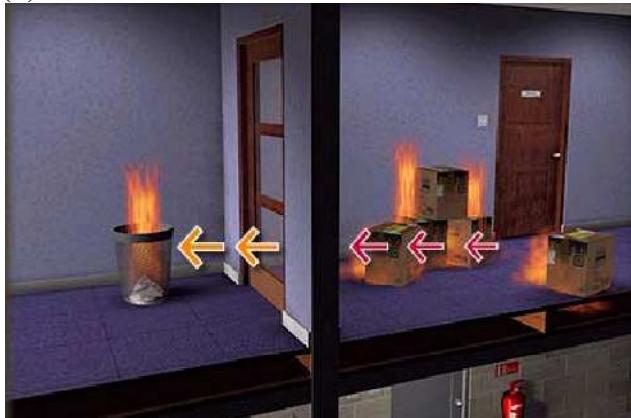
Q18 Identify the process of heat transmission/fire spread shown in the following photographs.

(i)



A18 (i) Convection;

(ii)



A18(ii) Radiation;

(iii)



A18(iii) Conduction.

Q19 What additional method of heat transfer/fire spread is not illustrated by the photographs above?

A19 Direct burning

Q20 Identify the fire classification of each of the following types of fire.

- (i) Butane gas cylinders burning in the storage area of a garden centre.
- (ii) Fire in the paint shop of a car manufacturer.
- (iii) Fire in an office.

A20

- i) Class C – fires involving gases or liquefied gases..
- (ii) Class B – fires involving flammable liquids or liquefied solids.
- (iii) Class A – fires involving solid, mainly carbonaceous, materials (here, most likely paper and furniture, etc.).

Q21 How might you minimise the risk of fire in a woodworking area?

A21 Fire risk can be minimised by ensuring that wood shavings and dust are cleared regularly and ignition sources such as cigarettes and sparks from electrical equipment do not come into contact with combustible materials.

Q22 What precautions should be taken when using flammable liquids?

A22 The volume of flammable liquids in use at any one time should be minimised and it should be held in appropriate (usually metal), correctly labelled containers with secure lids. The need to decant highly flammable liquids from one container to another should be minimised, thus reducing the risk of spillages.

Q23 Upon what does the fire resistance of each of the following building materials depend?

- (i) Timber
- (ii) Reinforced concrete
- (iii) Brick walls

A23

(i) The fire resistance of timber depends on the “four Ts”: the thickness or cross-sectional area of the piece, the tightness of any joints involved, the type of wood and any treatment received.

(ii) The fire resistance of reinforced concrete depends on the type of aggregate used and the thickness of concrete over the reinforcing rods.

(iii) The fire resistance of a brick wall depends on its thickness, the applied rendering or plastering, whether the wall is load-bearing or not, and the presence of perforations or cavities within the bricks.

Q24 Describe the effects of fire on an unprotected steel beam.

A24 The beam will distort, possibly causing the collapse of any structure it is supporting. It will also conduct heat and increase the possibility of fire spread.

Q25 Describe how flame retardant paint protects covered timber.

A25 When exposed to heat the paint bubbles rather than burns and thus gives additional protection to the covered timber.

Q26 What three elements should be addressed in any assessment of fire risk?

A26 A site plan, the fire hazards and their level of risk, and fire control and evacuation measures.

Q27 What are the limitations of manual alarm systems and how may they be overcome?

A27 Manual systems alone can only raise an alarm over a limited area and for a limited time. There has to be some means for the person raising the alarm to make it general – by using the phone or public address system, or a manual/electric system.

Q28 Identify the three ways in which fire may be detected and state the types of automatic detector associated with each.

A28

- (i) Detection of smoke or other fumes by ionisation or optical smoke detectors.
- (ii) Detection of flames by ultra-violet and infra-red radiation detectors.
- (iii) Detection of heat by fusion or expansion heat detectors.

Q29 Identify the three ways of extinguishing a fire.

A29 Starvation (removing the fuel), smothering (removing the oxygen) and cooling (removing the heat).

Q30 Identify the classes of fire for which each of the following extinguishing agents/devices are suitable.

- (i) Water
- (ii) Carbon dioxide gas
- (iii) Dry powder
- (iv) Foam
- (v) Fire blankets.

A30

- (i) Water – class A
- (ii) Carbon dioxide gas – classes A and B
- (iii) Dry powder – classes A, B, and D
- (iv) Foam – class B
- (v) Fire blankets – classes A, B, D and F

Q31 State the four colour coding requirements for portable fire extinguishers.

A31

- Water – Red
- Chemical foam – Cream
- Carbon dioxide – Black
- Dry powder – Blue

Q32 Outline the main points to be covered in training in the use of fire extinguishers.

A32 General understanding of how extinguishers operate.

The importance of using the correct extinguisher for different classes of fire.

Practice in the use of different extinguishers.

When to and when not to tackle a fire.

When to leave a fire that has not been extinguished.

Q33 What areas may be used as assembly points?

A33 An assembly point should be a place of ultimate safety (outside the building, in the open air, away from any further danger from the fire) or a place of comparative or relative safety, in a fire-protected area.

Q34 What should take place in an assembly point following an evacuation?

A34 There should be a roll call to ensure that all people in the affected area are present.

Q35 State the escape times and distances for

- (i) High fire risk areas
- (ii) Normal fire risk areas
- (iii) Low fire risk areas.

A35

- (i) High fire risk areas – one minute or 12 - 25 metres
- (ii) Normal fire risk areas – three minutes or 18 - 45 metres
- (iii) Low fire risk areas – five minutes or 45 - 60 metres

Q36 What is the purpose of signs used on escape routes?

A36 To direct occupants to the means by which they can safely leave the premises.

Q37 Outline the main requirements for an escape route.

A37 The escape route should be as straight as possible direct to the assembly point, clear of obstruction, free of materials which could pose a fire hazard, and be wide enough throughout (including at doorways and openings) to provide for the unrestricted flow of people.

Q38 List the actions for which fire marshals/wardens are responsible when an evacuation takes place.

A38 Ensuring all occupants leave by the designated escape route.

Searching all areas to ensure that the area is clear.

Ensuring that fire escape routes are kept open and clear at all times.

Ensuring all doors and windows are closed on leaving the area.

Conducting the roll call at the assembly area.

Meeting the fire brigade on arrival and informing them of all relevant details.

Element 6 Chemical and biological health hazards and control

Q1 Explain and give examples of the four types of occupational health hazard as categorised by the syllabus:

- physical
- chemical
- biological
- ergonomic

A1 The four types of occupational health hazard (as categorised by the syllabus):

• physical hazards, including:

- » noise
- » vibration
- » electromagnetic radiation including visible light, ultraviolet, microwaves
- » ionising radiation: X-rays, alpha, beta and gamma radiation

» thermal environment hazards, both hot and cold

• chemical hazards, which may be sub-divided in a number of ways, including:

» toxic, harmful, corrosive, irritant, carcinogenic (CHIP ‘risk phrases’)

» acute, chronic

» by target organ

• biological hazards, by way of examples you could give:

» hepatitis B

» AIDS

» legionellosis

» leptospirosis

» genetically-modified organisms

» diseases associated with the laboratory

Alternatively, you could place biological hazards into the following categories:

» virus - extremely small organisms: rabies, common cold, flu, AIDS

» bacteria - single cell organisms: legionnaires' disease, anthrax, tuberculosis, tetanus

» other micro-biological agents such as fungus conditions, bird-handlers' disease

» genetically modified organisms

• ergonomic hazards

» manual handling hazards

» musculoskeletal disorders

» hazards associated with display screen equipment

Q2 Define ‘acute’ and ‘chronic’ and give some examples for chemical and biological agents.

A2 Acute, chronic ... words which, in normal speech, are used in a fairly haphazard manner; in health and safety the meanings are well-defined:

• an acute condition is one in which the body shows an immediate response to exposure; full

recovery from an acute condition will probably occur unless of course, the victim dies.

- a chronic condition is one which develops over a long period of, probably, low exposure levels;

chronic conditions may have periods in which they do not worsen, but full recovery will not occur.

As we explained in the text, some agents (carbon monoxide, benzene) can be responsible for both acute and chronic conditions. Our question specifically referred to acute and chronic biological health hazards; examples might be legionnaires' disease (acute), tuberculosis and athletes foot (chronic). Does the example of athletes foot show that some chronic conditions may in fact recover, contrary to what we said above; or do we say that in the long periods when the condition of athletes foot is not apparent it can be said to be dormant?

Q3 Define 'local', 'target organ' and 'systemic'.

Although experience shows that NEBOSH rarely ask a 'parts of the body' question, you should be able to provide a brief outline of the organs of the body which we mentioned in the text – respiratory system, skin, kidney, liver, circulatory system, brain / CNS.

A3 Local, target organ, systemic. Remember that the syllabus lists a dozen 'specific agents' (ammonia, chlorine, ...), the individual hazards of which you must know. It is useful to have a few other examples up your sleeve for questions like this ...

... carbon tetrachloride enters the body via the respiratory system and acts in the liver (target organ); acid burn (local); lung damage by a substance taken into the respiratory system (local).

Systemic tends to be taken to mean that the effect involves the whole organism but strictly systemic means that the substance has to travel through the body to its place of action, for example tetraethyl lead which acts in the brain having travelled through the body from the skin

or the gut or the lungs.

Q4 Define, with examples if possible, the terms which are listed in the syllabus: toxic, harmful,

corrosive, irritant, asphyxiant, narcotic, carcinogenic, teratogenic/mutagenic.

A4 Toxic, harmful, corrosive, irritant, asphyxiant, narcotic, carcinogenic, teratogenic/mutagenic.

These are all defined in the study material; check your answers. In this sort of question it may be useful to 'place' the definitions of 'toxic' etc in the context of the CHIP legislation and guidance material such as EH40.

Q5 Describe, with examples, the main routes of entry into the body for substances (obviously it

is toxic substances with which we are particularly concerned).

A5 Routes of entry into the body for (toxic) substances:

- inhalation
- injection
- ingestion
- skin absorption

Inhalation is usually described as being 'the most important' route of entry; we need to be careful here because, for example for (say) hepatitis B, injection is the route of entry. By now,

you will appreciate that 'the most important route of entry' really is a shorthand way of saying

'the route of entry which is applicable to most agents and substances which can cause harm to the body'.

Q6 What is the significance of the 'particle' size of airborne contaminants, pollutants and microbiological agents?

A6 The size of any airborne contaminant (gas, vapour, mist, dust etc) will determine how far they will travel in the respiratory system. Large particles (grit) will be unable to negotiate their way into the respiratory system at all (think of the orientation of the nose); contaminants of size 10- 100 microns (10-6 metre) will get trapped somewhere in the upper respiratory system and very fine particulates and gas molecules and fine mist will travel all the way to the gas transfer region of the lungs, perhaps becoming trapped or perhaps being subsequently breathed out.

Q7 Define the terms listed in the syllabus which encompass airborne liquids and particles:
gas/

vapour, mist, smoke, fume, dust; which of these would fall into the category of 'aerosol'?

A7 Gas, vapour, mist, smoke ... the syllabus requires that you must know the meaning of these

terms; if necessary, refer back to our text. Ensure that you appreciate the health and safety meaning of 'aerosol'.

Q8 There are three common ways of expressing the airborne concentration of a substance - **Explain.**

A8 The airborne concentration of a substance may be expressed:

- weight per volume: mg / m³
- ratio: parts per million
- number of fibres in a given volume of air: fibres / millilitre

In the text we asked you to say which would be the appropriate way(s) of expressing the concentration of six substances; please make sure that you did indeed tackle this question and are happy with the answer.

Q9 What would you say is the difference between air sampling and air monitoring?

A9 Air sampling, air monitoring

As we mentioned in the study material, words like 'sampling', 'surveying', 'checking', 'monitoring' tend to have somewhat flexible meanings (unlike some health and safety terms such as 'risk' and 'hazard' which, as we have explained, have very clearly defined meanings).

Air monitoring implies a continuing fairly detailed evaluation of the levels of pollutants in the air, whereas air sampling implies a more limited exercise. It could of course be that the air monitoring is required because the results of a one-off air sampling exercise indicate that more detailed investigations are required. We refer you back to the text for a brief glimpse of some of the factors that would need to be taken into account in developing an appropriate strategy in investigating and controlling the pollutants in a particular environment - for example, don't waste time and money on detailed air monitoring when it is obvious that the situation demands that resources need to be concentrated on improving control.

Q10 Hardwood dust has a long-term WEL of 5 mg m⁻³. A worker is exposed to hardwood dust at a concentration averaged over a day of 4 mg m⁻³. Is this acceptable?

A10 An averaged hardwood concentration of 4 mg m⁻³ (WEL of hardwood = 5 mg m⁻³) is not acceptable. There is a legal obligation to bring it as low as reasonably practicable.

Q11 An operator is exposed to a general dust at a concentration of 6 mg m⁻³ averaged over the day. This dust has a long-term WEL of 5 mg m⁻³. Is this acceptable?
A11 No, it is not acceptable.

Q12 What provision is there in EH 40 to deal with exposure levels which ‘peak’ from time to time in the day?
A12 The 15 minute short-term limit (STEL) is intended to accommodate exposure levels which ‘peak’ from time to time in the day.

Q13 In addition to the nature of the contaminant (ie what is in the air?), what other factors might be investigated by air monitoring? (You should be able to add three or four factors.)
A13 In addition to identifying unknown pollutants, air monitoring may be used to determine the concentrations of the contaminants, the variations throughout the workplace and variations during the shift / weekly work cycle.

Q14 A list of the most common reasons for undertaking air monitoring would probably start with:
• to estimate exposure of personnel to contaminants. Add another three or four reasons for undertaking air monitoring.

A14 Reasons for undertaking air monitoring include:

- assessing the exposure of personnel - individual and collective - to contaminants
- to assess compliance with hygiene standards, ie workplace exposure limits (WEL) or, in the case of substances without a WEL, to assess compliance with an internally derived standard
- to check the effectiveness of the control measures such as local exhaust ventilation which are in force
- selection of appropriate respiratory protective equipment which depends on the full identification of the contaminant
- emergency or alarm monitoring in, for example petrochemical plant, to ensure that leakages do not lead to explosive or toxic concentrations of gases; alarm monitors may be portable and carried by the worker or they may be in a fixed position, permanently ‘on guard’ whether or not the site is occupied

Q15 Briefly list a few key points to outline the similarities and differences between personal monitoring and area monitoring.

A15 In outlining the similarities and differences between personal monitoring and area monitoring you should have pointed out that personal equipment must be ergonomically acceptable to the worker.

If correctly chosen and operated, such portable equipment will be able to assess the level of the contaminant which is present in the worker’s breathing zone as the worker pursues his/her normal pattern of work. For some gases and vapours, personal equipment may provide a ‘real time’ value for the concentration of the contaminant or the sample may be collected for subsequent analysis - particularly when the contaminant is a solid. Area equipment can be more sophisticated, providing a full read-out of the levels of one or more contaminants over the chosen time period.

Q16 Why do you think that it is necessary to have exposure limits for general workplace

dust?

A16 General workplace dust ('nuisance dust') has an occupational exposure limit because such dust may cause irritation to the worker.

Q17 Outline the operation and use of a colour detector tube (chemical indicator tube) for measuring the concentration of a gas or vapour in the air.

A17 A colour detector tube (chemical indicator tube, stain detector tube, Dräger tube) operates by drawing a known amount of air through a chemical packed into the tube. The air may be drawn through in perhaps 10 'gulps' over a period of a few seconds or, if a long-term average concentration is required, over a period of several hours by a small battery-driven pump. The chemical in the tube will change in some way (colour, depth of stain, density of stain) and this will give a measure of the concentration of the contaminant in the air.

Q18 Outline the hierarchy of control for substances, with examples.

A18 Hierarchy of control for substances; our text provides examples under each of the following:

- elimination of exposure (perhaps in conjunction with enclosure, when for example a welding process is automated)
- substitution: water-based degreasing agents for solvent-based
- modification of the process (engineering control)
- enclose the process, perhaps in conjunction with other controls such as automation or the introduction of LEV
- ventilation control
 - » local extract ventilation (LEV)
 - » dilution ventilation for low levels of non-toxic pollutants
- personal protection
- ... at each and every level of the hierarchy ... administrative issues

Q19 Outline the limitations of personal protective equipment with regard to hazardous substances.

A19 The limitations of PPE focus on the fact that, even when well-selected, fitted and used, they will only protect the person wearing it. In practice, PPE will often fail to achieve the full manufacturers level of protection because:

- it is inappropriately chosen
 - ill-fitting (beards, spectacles)
 - conflicts with other PPE (hearing protection and RPE are frequently badly combined)
 - not maintained, stored and cleaned
 - not worn for 100% of the time that it should be worn; as we have explained, failure to wear (say) hearing protection for only short periods can greatly increase exposure levels
- Not really a limitation of PPE as such, but certainly worth mentioning in your answer is the fact that PPE can be used as a cover for poor practice in the workplace, an alternative to undertaking the control measures that should be undertaken - engineering control, LEV etc.

Q20 Administrative issues can be seen as applying through the hierarchy of control; **Give** some examples of what we might call 'administrative control'.

A21 Administrative control will encompass:

- training workers in the correct use (including cleaning, maintenance and emergency procedures) of the equipment they encounter and use in the workplace
- training in the selection, storage, maintenance, use of any personal protective equipment that is required for the protection of the worker
- reduce the number of employees exposed to hazardous activities and their time of exposure
- ensure good housekeeping: cleaning schedules, control of eating, drinking and smoking
- control of hazardous substances throughout their life-cycle: receipt, storage, use, disposal
- provision of facilities for washing, changing, storage of clothes
- record keeping

As we've said before, you can't go wrong with 'record keeping' - it has almost universal relevance in health and safety. Clearly your answer will be better if you give some examples of the records that should be kept - in this case you could mention records of the purchase, supply and use of PPE, training records, data sheets for the substances which are used, and so on.

Q22 Ventilation is one form of (engineering) control. Explain the difference between general dilution ventilation and local exhaust ventilation. Sketch a simplified figure showing the main components of a local exhaust system.

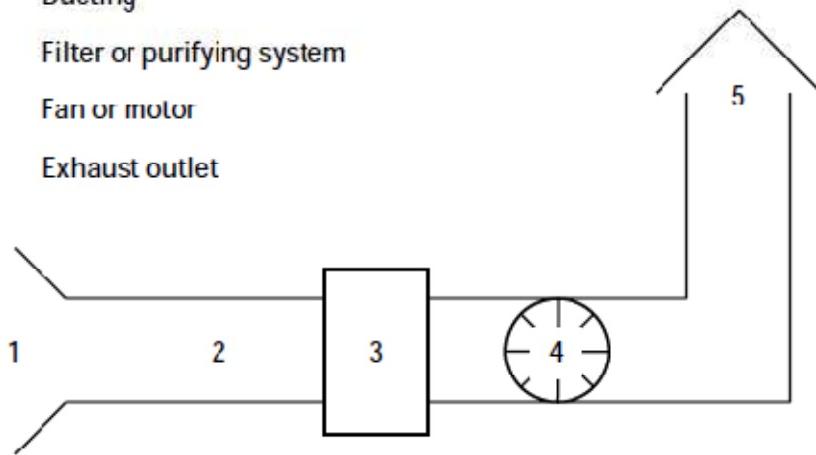
A22 General ventilation may be appropriate in the control of substances of low hazard and/or in

providing thermal comfort and a supply of fresh air. Local ventilation may be portable (for example, extraction systems which can be wheeled to the place where welding is taking place) or fixed around the site of the pollutant (you should be able to provide a handful of examples here, check the text if necessary). The main components of a local exhaust system must include:

- device for gathering contaminated air (hood)
- ductwork to take the contaminated air from the hood to ...
- collection device (cleaning the air and disposal of waste)
- air-moving device (fan)

In general, these systems are made up of five main parts:

- 1 The hood or exhaust inlet
- 2 Ducting
- 3 Filter or purifying system
- 4 Fan or motor
- 5 Exhaust outlet



A Local Exhaust Ventilation System

Q23 Health surveillance is particularly important for what class of hazardous substances?

A23 Health surveillance is particularly important for substances which cause allergic reactions, when the worker has become sensitised.

Q24 Outline some environments in which workers might come into contact with biological hazards.

A24 Environments in which workers might come into contact with biological hazards include:

- agriculture, food production, work associated with animals
- » animal husbandry and transport, slaughterhouses
- » contact with spores: mushroom growing, grain storage, etc
- » veterinary work, bird handling, laboratory animals, pet shops and garden centres
- building / demolition / repair work: birds droppings etc
- health care workers: TB, AIDS, hepatitis
- sewerage and drainage system work
- textile work: animal hair, cotton dust etc

These are just some examples of 'occupational' hazards, although of course, non-occupational

members of the public will not be immune to these hazards. In addition you might have mentioned

hazards such as humidifier fever and legionnaires' disease which are associated with micro-organisms in air conditioning systems. These are found throughout the built environment

- commerce, entertainment, recreational.

Q25 Briefly describe the three main routes of entry for biological agents.

A25 Routes of entry for biological agents:

- ingestion: food poisoning, for example salmonella, brucellosis

- inhalation: legionnaires' disease and tuberculosis
- skin entry: either through a wound (eg tetanus, Weil's disease) or a bite by an insect (malaria) or an animal (rabies) or via contaminated body fluids (AIDS, hepatitis B)

Q26 List 10 or so methods of control that could be used in the control of the various microbiological agents - for example, the control that would be required when health surveillance shows that an individual is becoming sensitised to a particular allergen is immediate

change of work away from risk of exposure; now add to this first example.

A26 Some methods of control for microbiological agents; there are many examples from which to choose, including:

- control of rodents and insects
- personal protective equipment: full length boots for sewer workers (Weil's disease), RPE for workers who are liable to be exposed to bird-carried diseases
- health surveillance to show if a worker is becoming sensitised to a particular allergen; immediate appropriate action is then required
- good housekeeping including the collection and appropriate disposal of all contaminated clothes, animal bedding and waste; protect broken skin
- adequate ventilation
- disinfection - equipment, animal stalls
- scrupulous personal hygiene - changing clothes
- control (enclosure, ventilation) of the aerosols produced by equipment such as laboratory centrifuges and dryers
- proper design, commissioning and maintenance of engineering controls in water cooling and ventilation systems

Q27 State the forms of chemical agents which may arise in the workplace.

A27 Liquids, gases, vapours, mists, fumes and dusts.

Q28 Identify the three general classifications of chemical hazards.

A28 The classification of hazardous substances is split into three basic groups: Physico-chemical, Health and Environmental.

Q29 Distinguish briefly between acute and chronic ill-health effects.

A29 Acute ill-health effects arise where the quantity of a toxic or harmful substance absorbed into the body produces harmful effects very quickly, that is within seconds, minutes or hours. Chronic ill-health effects arise where the harmful effects of a substance absorbed into the body take a very long time to appear, perhaps months or even years.

Q30 Identify the routes of entry of chemical and biological agents into the body.

A30 Inhalation, ingestion, absorption, aspiration and injection.

Q31 What are the conditions which allow the Legionella bacterium to develop?

A31 The Legionella bacterium thrives in:

- Water temperatures in the range of 20-45°C.
- The presence of sediment, sludge, scale and/or organic material in the water which act as a source of nutrients.

- Slime on the surface of water.

Q32 What is the difference between the effects of CO₂ and CO?

A32 Both carbon dioxide and carbon monoxide are asphyxiants, that is when inhaled they do not cause direct injury to the respiratory tract, but reduce the oxygen available to the body.

CO₂ is a simple asphyxiant which displaces air, whereas CO is a chemical asphyxiant which combines with haemoglobin to form a compound which prevents oxygen transport by the blood.

Q33 What is the difference between an inhalable substance and a respirable substance?

A33 Inhalable substances are capable of entering the mouth, nose and upper reaches of the respiratory tract during breathing. Respirable substances are capable of deeper penetration to the lung itself. It is the size of the individual particle which determines whether a substance such as a dust is inhalable or respirable.

Q34 What is pneumoconiosis?

A34 Pneumoconiosis is the general term for an accumulation of dust in the lungs and the tissue reaction to its presence.

Q35 What do you understand by the term time-weighted average in relation to an WEL?

A35 Workplace Exposure Limits (WELs) are expressed as time-weighted averages, meaning that measurements are taken over a particular time period (15 minutes for short-term limits or 8 hours for long-term limits) and then averaged out. The concept of time-weighted averages allows concentrations levels to exceed the limit, provided that there are equivalent exposures below it to compensate.

Q36 Give three examples of the limitations of WELs?

A36 The limitation of WELs are:

- They are designed only to control absorption into the body following inhalation
- They take no account of human sensitivity or susceptibility (especially in relation to allergic response)
- They do not take account of the synergistic effects of mixtures of substances
- They do not provide a clear distinction between “safe” and “dangerous” conditions
- They cannot be applied directly to working periods which exceed eight hours
- They may be invalidated by changes in temperature, humidity or pressure.

Q37 What information is generally provided on the label of a substance or preparation which has been classified as dangerous?

A37 The label on a preparation which is dangerous for supply must give the following information:

- The name(s) of the hazardous constituents
- The indication(s) of danger and the corresponding symbols
- The risk phrases
- The safety phrases
- Name, address and telephone number of the supplier.

Q38 What is the purpose of safety data sheets?

A38 Safety data sheets are intended to provide users with sufficient information about the hazards of the substance or preparation for them to take appropriate steps to ensure health and

safety in the workplace in relation to all aspects of their use, including their transport and disposal.

Q39 What is the difference between passive and active sampling devices?

A39 In passive sampling devices the air sample passes through/into the device by means of natural air currents and diffuses into a chamber containing an absorbent material which can be removed for later analysis. In active sampling devices the air sample is forced through the instrument by means of a pump.

Q40 Give three examples of limitations in the use of stain tube detectors.

A40 The limitations of stain tube detectors are:

- The volume of air sampled may not be accurate due to incorrect assembly interfering with the air flow (through leaks, etc.) or incorrect operation
- There may be the possibility of cross-sensitivity of tube reagents to substances other than the one being analysed
- There may be problems caused by variations in temperature and pressure
- The indicating reagent in the tubes may deteriorate over time
- There may be variations in the precise reagent make-up between tubes
- Hand-operated detectors are capable of only a single “point in time” spot sample.

Q41 What are smoke tubes used for?

A41 Smoke tubes are used to test the effectiveness of ventilation or air conditioning systems and chimneys, to detect leaks in industrial equipment, to assess relative air pressures used in certain types of local ventilation systems, and to provide general information about air movements in a work area.

Q42 What principles of control are illustrated by the following measures?

- (i) Using granulated pottery glazes instead of powders
- (ii) Vacuum cleaning rather than sweeping up with a broom
- (iii) Job rotation
- (iv) Using water-based adhesives rather than solvent-based ones.

A42 The principles of control that illustrated by the above measures are:

- (i) Substitution
- (ii) Work process change
- (iii) Reduced time exposure
- (iv) Elimination

Q43 What is the difference between local exhaust ventilation and dilution ventilation?

A43 Local exhaust ventilation (LEV) is a control measure for dealing with contaminants generated from a point source. Dilution ventilation deals with contamination in the general atmosphere of a workplace area.

Q44 What are dead areas and why are they a problem for dilution ventilation systems?

A44 Dead areas are areas in the workplace which, owing to the airflow pattern produced by the positioning of extraction fans and the inlets for make-up air used in the ventilation system, remain motionless and so the air is not changed. They can move from one position in the workplace to another as a result of changing the positions of fans and inlets, by draughts of air through windows and doors or moving the position of machinery or workbenches.

Q45 List the five main types of respirator and the three main types of breathing apparatus

A45 The main types of respirator are filtering face-piece respirators, half-mask respirators, full-face or canister respirators, powered clean-air respirators and powered visor respirators. For breathing apparatus the three main types are fresh air hoses, compressed airlines and self-contained systems.

Q46 What are the key criteria in the selection of the appropriate respirator to use?

A46 The type of hazard (dust, gas, vapour, etc.) and the category of danger, contaminant concentration levels and wearer acceptability.

Q47 What is the main purpose of routine health surveillance?

A47 The main purpose of routine health surveillance is to identify at as early a stage as possible any variations in the health of workers which may be related to working conditions

Element 7 Physical, ergonomic and psychological health hazards and control

Q1 Define a ‘VDU worker’ and outline the basic ergonomic checks and adjustments that should

be undertaken on a work station.

A1 Workers covered by the DSE legislation ... this needs some explaining. The DSE Regulations apply where staff habitually use VDUs as ‘a significant part of their work’. Workers who use VDUs only occasionally are not covered by the Regulations but such workers are still covered by the general duties of other health and safety legislation. Thus you can imagine that the DSE Regulations will ‘kick-in’ if they are needed.

Q2 Outline an employers responsibilities regarding eye tests and the provision of prescription spectacles.

A2 Eye tests: employees covered by the DSE Regulations can ask their employer to provide and pay for an eyesight test; (you will be able to link this back to the question of whether a worker is, or is not, a DSE-worker). Employees only have to pay for spectacles if special spectacles are needed for the work in question.

Q3 Who is responsible for reporting defects in the workplace?

A3 Looking at the wider picture, as you know it is the responsibility of the employee to report any observed defect, whether it be a relatively trivial broken towel rail or life-threatening - the measures that the employee takes should of course reflect the urgency that the situation demands: report the towel rail by a memo at the end of the day ... ‘stand guard’ over a machine which appears to have developed a serious electrical fault.

Q4 As in so many other areas of the syllabus and in so many sets of Regulations, maintenance

considerations thread their way through the Workplace Regulations. What should a suitable system of maintenance encompass?

A4 ‘Maintenance’ should encompass:

- regular maintenance:
 - » inspections
 - » testing
 - » lubrication
 - » cleaning
- systems for:

- » dealing with immediate hazards
 - » ensuring that personnel are not exposed to any danger:
 - while work is being carried out
 - while the equipment is out of action
 - competency of individuals who carry out maintenance work
 - maintaining accurate records of all work carried out
- Of course, it is difficult to imagine any piece of equipment that needs no maintenance, ever; you should be able to provide examples of equipment with specific maintenance requirements, equipment such as: emergency lighting, air conditioning, escalators, ventilation systems. You should also appreciate that, for some equipment, statutory maintenance requirements apply; you should be able to give some examples.

Q5 Two noise sources independently give a sound pressure level of 92 dB, what will be the overall sound pressure level if they operate at the same time?

A5 A sound pressure level of 92 dB combined with another sound pressure level of 92 dB gives an overall sound pressure level of 95 dB. This 3 dB difference is barely perceptible to the human ear although it involves a doubling of the amount of energy involved. The ear will perceive a ten-fold increase in energy (ie ten similar sources) as being twice as loud.

... ten times the energy, ten times the expense, ten times the enjoyment, but only twice as loud
...

Q6 Isolation, insulation, absorption, damping, silencing - the engineering noise control terms that NEBOSH require you to be able to explain and illustrate with examples; several times in the last ten years, this has formed the basis of a Certificate question. Accordingly, provide explanations and examples for each of these terms.

A6 Isolation, insulation, absorption, damping, silencing ... using the study material, check your descriptions and examples of these terms; remember that, because of the ambiguity in the use of these terms, it is important to use examples to illustrate your definitions.

Q7 Using examples of your own choosing, **explain** how different noise sources can have very different noise characteristics (sometimes called noise 'profile'). As a challenge, you might like to extend your answer to encompass the sorts of noise control measures that might be appropriate for the different noise profiles that you have identified.

A7 A full description of the noise characteristics of a particular environment will need to encompass:

- intensity of the noise, dB
- frequency characteristics of the noise (high frequency noise from steam jets etc)
- the pattern of the noise as it changes with time (at its most extreme, this could be periods of general engineering workshop noise with the occasional very loud impact noise from a power press) ...
- ... characteristics of any impact or percussive noise peaks which do occur
- overall noise level, summed up over a period of, perhaps, 8 hours; Leq or LEP,d
- characteristics of the workplace: reverberation time, passage of noise along duct work and so on

The purpose of drawing up this noise profile is of course to ensure that the most effective noise control measures can be taken.

Q8 Outline the two main types of personal hearing protection together with their advantages and disadvantages.

A8 There are many types of hearing protection but they can all be categorised as plugs or muffs; the study material gives examples of the advantages and disadvantages of each type which include:

- muffs, some advantages
 - » convenient for putting on and off in situations where the noise is not continuous (road drilling)
 - » ditto in situations where communication is required during quiet periods
 - » built-in (radio) communication possible using muffs (helicopter pilots)
- muffs, some disadvantages
 - » may clash with other PPE
 - » can prove uncomfortable with continued use
- plugs, some advantages
 - » unlikely to clash with other PPE
 - » not uncomfortable
 - » can provide good protection (for example, special plugs are available for impact noises)
 - » plugs are always ready, ‘on-guard’ (providing they are being worn of course)
- plugs, some disadvantages
 - » cannot easily be taken in and out (think of communication implications)
 - » require careful storage and fitting

Q9 Personal hearing protection is of course the last option in the hierarchy of control of noise

-

Outline the steps that should be taken before deciding on this option.

A9 Personal hearing protection, the last option in the hierarchy of control

As always, make sure that you are answering the question which is asked ...

... our question asks which options should have been eliminated before hearing protection is chosen ... a good answer should thus concentrate on the higher levels of the hierarchy. If the candidate instead provides a rich essay on hearing protection as such, very poor marks will be achieved - this happens.

Your answer should thus encompass:

- legislation - Noise Regulations and the associated action levels
- noise survey to establish the cause and characteristics of the workplace noise
- noise control - isolation, insulation ... etc
- role of hearing protection in situations where control by other means proves insufficient

Q10 Outline typical uses of the following members of the electromagnetic family of radiations

- radiowaves
- microwaves
- infra-red
- lasers
- ultraviolet
- X-rays and gamma-rays

A10 Typical uses of the following members of the electromagnetic family of radiations are given in the study material and we will not repeat them here. We should emphasise that, firstly you

should know the members of the electromagnetic family which does NOT include alpha and

beta radiation but does include gamma radiation. Secondly, do check whether the question is referring to radiation which is produced as an (unwanted) by-product of a process, for example: infra-red from glass-blowing, ultraviolet from welding or whether the radiation is produced intentionally, as in the examples given in the study material, such as the generation of ultraviolet light for sterilisation purposes.

Q11 Give one or two uses for alpha and beta radiation sources.

A11 Alpha and beta radiation sources are used to eliminate static electricity from a product or component in order either to reduce the risk of a static discharge causing a fire or explosion (in inflammable atmospheres) or to protect workers or electronic components from risk of static shock. You could also have mentioned:

- alpha particle sources in smoke detectors
- beta particle sources used in various devices for measuring the thickness of continuously created products such as paper and fabric

Q12 Explain, in terms of the human body, the significance of the process of ionisation.

A12 Ionisation ... in terms of living matter, the significance is that the injection of energy from the source of the ionising radiation will leave living cells in a highly unstable state, perhaps to return to normality, or to die or to mutate.

Q13 Outline the meaning of the terms:

- somatic effects
- genetic effects

A13 Somatic and genetic effects

- acute and chronic effects (can you name some?) which happen to the exposed individual are known as somatic effects
- ill-effects suffered by the offspring of the exposed individual and which involve chromosome damage - genetic effects

Q14 Present the case for personal protective equipment in a positive way (ie don't use phrases

such as 'in the last resort', 'the last option in the hierarchy of control ...' and so on).

A14 Presenting the case for personal protective equipment in a positive way:

- a sensible precaution, a 'long-stop' in situations involving dangerous chemicals (acid in a laboratory) or materials (molten metal) or mechanical hazards such as grinding wheels
- good practice in situations involving groups of young and inexperienced students and visitors (notably the use of eye protection)
- striking the right balance in the hierarchy of control ... as we have said in the study material, it might be possible to introduce such a high level of engineering control in a metal-work shop that workers could wear peep-toe sandals, but this would be an absurd mis-use of resources, far better to accept that occasionally a small piece of metal will drop on to a worker's well-protected foot and to concentrate resources on ensuring that (say) large pieces of metal are always fully under control

Q15 Provide 10–15 examples of the use of different types of PPE to protect different parts of the

body and the body as a whole.

A15 Different types of PPE: we refer you to the study material for a wide range of examples of PPE - gloves, oversuits, RPE, boots, high-visibility clothing (this is a very important form of PPE), ear muffs and so on. Make sure that you have this rich 'catalogue' of equipment in your memory for just such a question.

Q16 Identify some hazards which may be created by the use of PPE.

A16 The main hazards which may be created by the use of PPE include:

- communication problems
- discomfort (particularly in situations where there is a PPE conflict) at the worst leading to PPE being discarded with consequent loss of protection
- interference with vision and general awareness
- thermal stress, particularly in the case of full protective clothing
- false sense of security, either because the PPE has been incorrectly chosen or is faulty or poorly maintained

Q17 There are hundreds of different types of RPE but they can all be classified as being in one

(or occasionally both) of two main categories - what are these?

A17 All RPE can be placed in one of two broad categories:



- respirators: air-purifying devices which ranges from: to:

- breathing apparatus: air-supplied devices which provide a supply of fresh air to the worker from an oxygen cylinder or via a supply line, for example:

Q18 Under what circumstances do you think it will be necessary to use air-supplied RPE devices?

A18 Environments demanding the use of such air-supplied RPE devices; you should remember three particular situations:

- if there is immediate danger to health
- in cases of oxygen deficiency (no amount of purification can be guaranteed to provide the required oxygen)
- in confined spaces

Q19 List some possible 'heat-in' and 'heat-out' mechanisms for the human body - some mechanisms can act in both directions, some one way only.

A19 For the 'heat-in' and 'heat-out' mechanisms of the human body - if you understand this then everything else in this subject area follows easily - see the study material for this element.

Q20 Outline some illnesses associated with heat.

A20 Thermal (heat) illnesses include:

- circulation disorders

- water or salt imbalance
- skin disorders (prickly heat)
- extreme disorders in which the body enters a state of physical and perhaps mental collapse (mental collapse may mean that the individual loses the ability to take the necessary lifesaving

actions) If the body's thermoregulatory system breaks down, a rapid increase in the core body temperature will occur; sweating stops and serious mental disturbance may occur. When the core temperature reaches 42 C, rapid action is needed to cool the person to prevent death or permanent damage.

The most effective way of reducing core temperature to 39 C or lower is to spray the body with tepid water (to simulate sweating) and increase air movement around the body.

Q21 Outline some illnesses associated with exposure to cold.

A21 Illnesses associated with exposure to cold:

- hypothermia (general body)
- frostbite (extremities)

Hypothermia occurs when the body core temperature falls below 35 C; the body will react by shivering between 36 and 32 C; below 32 C, shivering stops, the heart rate decreases and respiration becomes depressed, disorientation occurs and consciousness may be lost. If the core temperature falls to 26 C, there is a very serious risk of cardiac arrest and the victim needs

to be placed in an environment where no further heat loss occurs and any heat which is generated by the victim's body is retained by wrapping gently in dry blankets.

Q22 In addition to climatic conditions, **outline** some other factors which might be of importance

in determining the level of heat stress on an individual.

A22 Other factors which might be of importance in determining the level of heat stress on an individual include:

- personal protective equipment:
 - » impervious over-suits and respiratory protection
 - » water-cooled suits
 - » gloves, aprons, gloves, headware
 - » rubber suit and thigh-length boots

... with consequent implications for the body heat balance.

Personal characteristics which affect the ability of an individual to cope with heat stress include:

- general state of health, including weight, fitness
- age
- race
- sex (women have a greater density of sweat glands but men tend to sweat more readily)
- degree of acclimatisation.

Q23 Sum up the aims of ergonomics in a simple phrase.

A23 Fitting the task to the worker.

Q24 What are the categories of health risks arising from poor task and workstation design?

A24 Physical stress, resulting in injury or general fatigue, visual problems and mental stress.

Q25 What is HAVS and how is it caused?

A25 Hand-Arm Vibration Syndrome (HAVS) is a condition produced at work by exposure to vibrations from hand-held tools. The vibration affects blood flow to the fingers and arms causing blanching of the fingers (white finger) and tingling of muscles, and may cause blocking and restriction of blood flow in small arteries and even gangrene.

Q26 State the risk factors involved in the physical requirements of the task.

A26 Posture and physical action, forces involved, repetition, and duration and recovery time.

Q27 What aspects of lighting are risk factors?

A27 Illumination, contrast, flickering and glare.

Q28 Summarise the requirements relating to the following elements of workstations.

- (i) Work surface/desk
- (ii) Keyboard
- (iii) Chair
- (iv) Space.

A28

- (i) The work surface or desk should be large enough to hold all necessary equipment and other items used from time to time, and to allow them to be arranged to suit the individual's needs. If necessary, it should also be deep enough to accommodate a VDU for viewing at a distance of about 350 to 600 mm without cramping the work surface in front of it.
- (ii) The keyboard should be of appropriate design to be usable in comfort, with keys of sufficient size and clarity to suit the demands of the task. It should be able to be tilted and separated from the screen so the operator can find a comfortable position.
- (iii) A work chair must have an adjustable seat back, good lumbar support and be adjustable in height to suit the user.
- (iv) There should be sufficient clear and unobstructed space at each workstation to enable the work to be done safely, allowing for the manoeuvring and positioning of materials. This should also provide for adequate freedom of movement and the ability to stand upright.

Q29 What does an $L_{EP,d}$ of 85 dB(A) mean and what is significant about this figure?

A29 This refers to a daily personal exposure to noise ($L_{EP,d}$) at a level of 85 dB(A) over the course of a working day (eight hours), or an equivalent exposure over a shorter period.

Q30 What are the limitations of ear defenders and earplugs?

A30 There is a general limitation on the level of noise reduction that can be achieved, depending on the quality and type of ear protection. Taking off the protection reduces its effectiveness. In addition, the seal between the ear and the protective device may be less than perfect due to long hair, thick spectacle frames and jewellery, incorrect fitting of plugs or the wearing of helmets or face shields.

Q31 Identify the protective measures to be used for working in conditions of extreme heat.

A31 Providing as much ventilation as is reasonable, ensuring that the length of time for which individual workers are exposed is limited, there are adequate rest facilities, away from the heat, with appropriate facilities to counter the effects of exposure, including cold drinks. Where there is a direct source of heat, protective clothing will have to be provided, such as face shields and heat/flame resistant footwear, gloves and clothing.

Q32 What type of non-ionising radiation is given off by the following pieces of equipment?

- (i) Radio transmitter
- (ii) Hot plate in a kitchen
- (ii) Arc welder in operation
- (iv) Laser

A32

- (i) Radio frequency
- (ii) Infra-red radiation
- (iii) Ultra-violet
- (iv) Visible radiation

Q33 What are the health risks of visible radiation?

A33 Visible radiation can cause serious burns to exposed skin tissue and is particularly dangerous to the eyes.

Q34 State the nine categories of cause of work-related stress and, for each; **Give one example of a preventive measure.**

- (i) Culture – Preventive measures include taking stress seriously, with encouragement to raise any problems, knowing that they will be recognised and dealt with promptly, and a recognition of the importance of the work-life balance.
- (ii) Work demands – Preventive measures include ensuring that there are sufficient resources available and support is offered to re-negotiate priorities and deadlines.
- (iii) Control over work – Preventive measures include encouraging workers to plan their work, and make decisions about how it is completed and how problems will be tackled.
- (iv) Relationships between staff – Preventive measures include clear standards of conduct and policies to tackle harassment and bullying.
- (v) Organisational change – Preventive measures include consultation and involvement of staff in determining processes.
- (vi) Role conflicts and uncertainties – Preventive measures include clear work objectives, job descriptions and reporting responsibilities.
- (vii) Support by management – Preventive measures include providing positive feedback, focusing on performance, not on personality.
- (viii) Training – Preventive measures include training needs assessments and the provision of appropriate training programmes where necessary.
- (ix) Factors unique to the individual – Preventive measures include taking account of individual differences in skills and approaches in allocating and managing work.

Q35 State the main risk factors for violence at work.

A35 The risk factors reside in particular situations such as:

- The handling of high value goods
- Contact with customers or clients where the outcome will be to refuse the person what they want
- Contact with customers/clients where the outcome is to censure them in some way
- Contact with customers/clients who are under stress (perhaps as a result of frustrations or delays in obtaining the necessary contact), under the influence of alcohol or drugs, or with a history of violence.

Q36 What strategies are available to avoid the risk of violence?

A36 Minimisation of cash handling, minimisation of customer/client frustration and refusing access to potentially violent customers and clients.

Element 8 Construction activities - hazards and control

Q1 List the most common causes of construction / demolition accidents.

A1 The most common causes of construction / demolition accidents involve:

- falls
- falling material and collapses
- electrical shock and burns
- mobile plant
- manual handling

In addition, the toll of illness and death from what we have called ‘slow’ accidents - noise, vibration, exposure to hazardous chemicals and so on, is more difficult to quantify but shockingly large.

Q2 Outline the rules for working at height to prevent falls - make sure that the first item in your

list sets the scene for the rules which follow.

A2 Rules you might adopt for working at height / the prevention of falls of workers include:

- no work at height unless it is essential; if work at height is unavoidable ...
- ensure that the working platform, of whatever type, is safe and secure, checking that:
 - » it is strong enough to support the weight of worker(s) and equipment
 - » it is stable and will not overturn (scaffolding needs to be tied to a supporting structure)
 - » the ground is stable and will support the structure
- provide guard-rails, barriers, toe boards etc:
 - » at all openings on floors
 - » close to edges on roofs
 - » on working platforms
- platforms etc to be constructed so as to be free of any openings or traps through which people’s feet could pass
- constructed so as to prevent material falling through; in particular:
 - » with a wire mesh floor, mesh should be fine enough to prevent materials slipping through
 - kept free of tripping and slipping hazards
 - kept clean and tidy

Remember that the above can be seen as another example of a control hierarchy with the first option being, as usual: ‘if possible, avoid the problem completely’. Without this first option, no set of rules for working at height could ever be complete. A risk assessment is needed for all work at height.

Q3 Extend the above rules for preventing falls to encompass the prevention of objects falling and endangering those below (whether workers or members of the public).

A3 The answer to question 3 touched on preventing objects falling (‘constructed so as to prevent material falling through ...’) and your answer should have extended this to encompass:

- appropriate storage of materials such as bricks at height
- enclosure by plastic sheeting of working areas when the work activities (shot blasting, water cleaning etc) inevitably leads to material being hurled around
- good housekeeping (a very useful catch-all phrase this - you can use it again and again in question after question)
- workers to be supplied with and use appropriate tool belts and tool pouches

Q4 Outline some of the factors that need to be taken into account when selecting the appropriate platform for work at height ...

A4 In selecting an appropriate work platform, some of the factors that need to be taken into account include:

- the length of time that the equipment is to be in use
- any risks to personnel during the building of the structure
- any maintenance problems if the platform will be up for a long period of time
- how many people will be using the equipment, and how often
- any problems securing the equipment to prevent the possibility of intruders, particularly children, climbing up
- at what stage in the construction programme the work platform will be brought into use

Q5 Outline some general rules for the safety of working platforms

A5 Safety of working platforms

Working platforms should be adequately supported and provided with guard rails or barriers and should be:

- wide enough to allow people to:
 - » pass safely
 - » use any equipment or material needed for their work
- free of any openings or traps through which people's feet could pass
- constructed so as to prevent material falling through; in particular:
 - » if there is a wire mesh floor, the mesh should be fine enough to prevent materials, especially bolts and nails, from falling through
- kept free of tripping and slipping hazards
- kept clean and tidy (yes again!)

If you think that this answer is rather similar to the answers to questions 3 and 4, then you are right for the simple reason that questions 3, 4 and 6 do overlap considerably. The temptation when faced with such a 'working at height / falls / platforms' question is to blaze away putting

down everything you can think of. NEBOSH do not use negative marking in the Certificate so

you would not lose marks by this 'elephant gun' approach but you would waste precious time;

accordingly read the question very carefully and see precisely what it is that the examiners are asking.

Q6 Outline the similarities and the differences between the two main types of general access scaffold: independent tied and putlog scaffolding. Give a couple of examples of their uses.

A6 We refer you back to the study material for this element NGC2/8 for the characteristics of these two types of general access scaffolding; remember, you should know the nomenclature: zig-zag bracing, timber sole board, ledger etc. An independent tied scaffold will probably be used for work on an existing building - the scaffold being erected alongside the building and 'holding on' very firmly via the ties made through existing window openings etc. A putlog scaffold will grow upwards as a new structure is created.

Q7 Outline the precautions to be taken in the use of temporarily suspended access cradles and

platforms.

A7 Temporarily suspended access cradles and platforms precautions include:

- adequate guard-rails and toe boards and material cannot fall off
- it can be fitted close to the building which must be capable of carrying the loads placed upon it
- a secondary safety rope fitted with a fall arrest device is provided and used
- adequate operating instructions and technical support are available
- there is safe access into, and safe egress from, the cradle

Q8 Provide a **list** of the main precautions to be taken for the safe storage and use of ladders.

A8 Ladders are a means of getting to a workplace. They may be used as a workplace in their own right for light short-term work only. If it is not possible to provide a better means of access and ladders have to be used, it is necessary to make sure that:

- the ladder(s) are in good condition
- the ladder(s) can be fixed to prevent running sideways or slipping away from the wall
- the bottom of the ladder is supported on a firm level surface, if possible making use of ladder 'feet'
- if the bottom of the ladder cannot be fixed then a second person should 'foot' the ladder, both to hold it firmly and as a look-out to stop people walking into it
- the ladder should extend a sufficient height above the landing place to ensure that workers can safely and comfortably transfer from and to the ladder

All light tools should be carried in a shoulder bag or holster attached to a belt leaving both hands free; heavy or bulky loads simply must not be allowed.

As a rule of thumb, the ladder needs to be 'one out for every four up'.

Particular care is needed with step ladders which are so prone to overturn when subject to any kind of side loading, caused for example by over-reaching.

Q9 Write a few sentences to **describe** the health and safety plan and one to **describe** the health

and safety file.

A9 The health and safety plan provides the health and safety focus for the construction phase of a project; it comprises a pre-tender health and safety plan (the responsibility of the planning supervisor).

The health and safety plan for the construction phase is developed by the principal contractor and is the foundation on which health and safety management of construction work is based.

The health and safety file is a record of information for the client/end user, which tells those who

might be responsible for the structure in future of the risks that have to be managed during maintenance, repair or renovation.

Q10 What are the requirements for a mixed store?

A10 In mixed stores, different goods and materials should be separated in different areas to allow for easy location and access. Incompatible hazardous materials should not be stored together, nor should flammable materials be mixed with other materials and flammable liquids, solids and gases should be kept separately.

Q11 What are the requirements for the internal storage of flammable materials?

A11 Internal stores for flammable materials must be constructed of fire-resistant materials and provide a good level of ventilation to stop dangerous levels of gases accumulating. The requirement for fire-resistant materials is not necessary if the store is a completely separate building located in a safe place.

Q12 What is the safe method of working on a fragile roof?

A12 The use of roof ladders (or crawling boards) laid across the roof surface, supported by the underlying load bearing roof members, in order to distribute the load of the worker over a wide area.

Q13 What are the main hazards of using ladders?

A13 Not being tied or not resting on firm ground, which may cause the ladder to tip. Poor storage and maintenance allowing the ladder to rot or warp, which may cause the rungs to break.

Q14 What measures should be taken to prevent materials falling from a height?

A14 To prevent materials from falling in the first place, the following control measures should be used:

- Not stacking materials near edges and particularly unprotected edges
- Close boarding of working platforms – minimising gaps between scaffold boards or placing sheeting over the boards so that material cannot fall through
- Avoiding carrying materials up or down ladders, etc. by using hoists and chutes to move materials.

Q15 In respect of scaffolding:

- (i) What is the difference between standards, ledgers and transoms?
- (ii) What is the difference between tying and bracing?

A15 In respect of scaffolding:

- (i) Standards are the vertical tubes (the uprights), ledgers are the horizontal tubes running parallel to the face of the building and transoms are the tubes spanning across ledgers to secure a scaffold transversely.
- (ii) Tying secures the scaffolding to the building, whereas bracing is used to stiffen the framework.

Q16 State the safety precautions which need to be taken when mobile elevating work platforms are in use.

A16 The precautions for the use of MEWPs are

- That there is firm sound ground for the vehicle to stand on
- That there must be sufficient clearance from any building or obstacle
- Barriers must be put in place to provide an exclusion zone which also prevents collisions with the equipment
- That there is adequate edge protection for the cradle
- That the controls of the arm should be inside the cradle.

Q17 What is the angle at which ladders should be positioned?

A17 75°

Q18 When should scaffolding be inspected?

A18 Before being used for the first time, after any substantial alteration or any event likely to affect its strength or stability, and at regular intervals (usually weekly) days.

Q19 Identify the main hazards associated with excavation work.

A19 The two main hazards are that things (and people) may fall into the excavation and that the ground will collapse into it. Other hazards include buried services, flooding and hazardous substances.

Q20 What is battering?

A20 Battering is the process of allowing the sides of an excavation to lie naturally at an angle to the floor of the excavation which is below the angle of repose for the materials involved.

Q21 What are the key elements of shoring?

A21 The key elements of shoring are the support boards laid against the face of the side wall and the struts which brace those boards against a secure surface.

Q22 Identify the requirements for crossing points.

A22 The crossing points should be of sound construction and suitable to support all the types of vehicles and equipment likely to use them. They should be fitted with guard rails and toeboards.

Q23 How can the hazards of buried services be avoided?

A23 By identifying, as far as possible, the location (routes and depth) and nature of all buried services before work starts, planning work to avoid them, marking their location on working plans and on the surface, and through safe digging practices.

Q24 When must excavations be inspected?

A24 At least daily and more frequently for deep excavations (exceeding 2 metres). Additional inspections will be required after any event likely to have affected the strength or stability of the excavation, or any part of it.

